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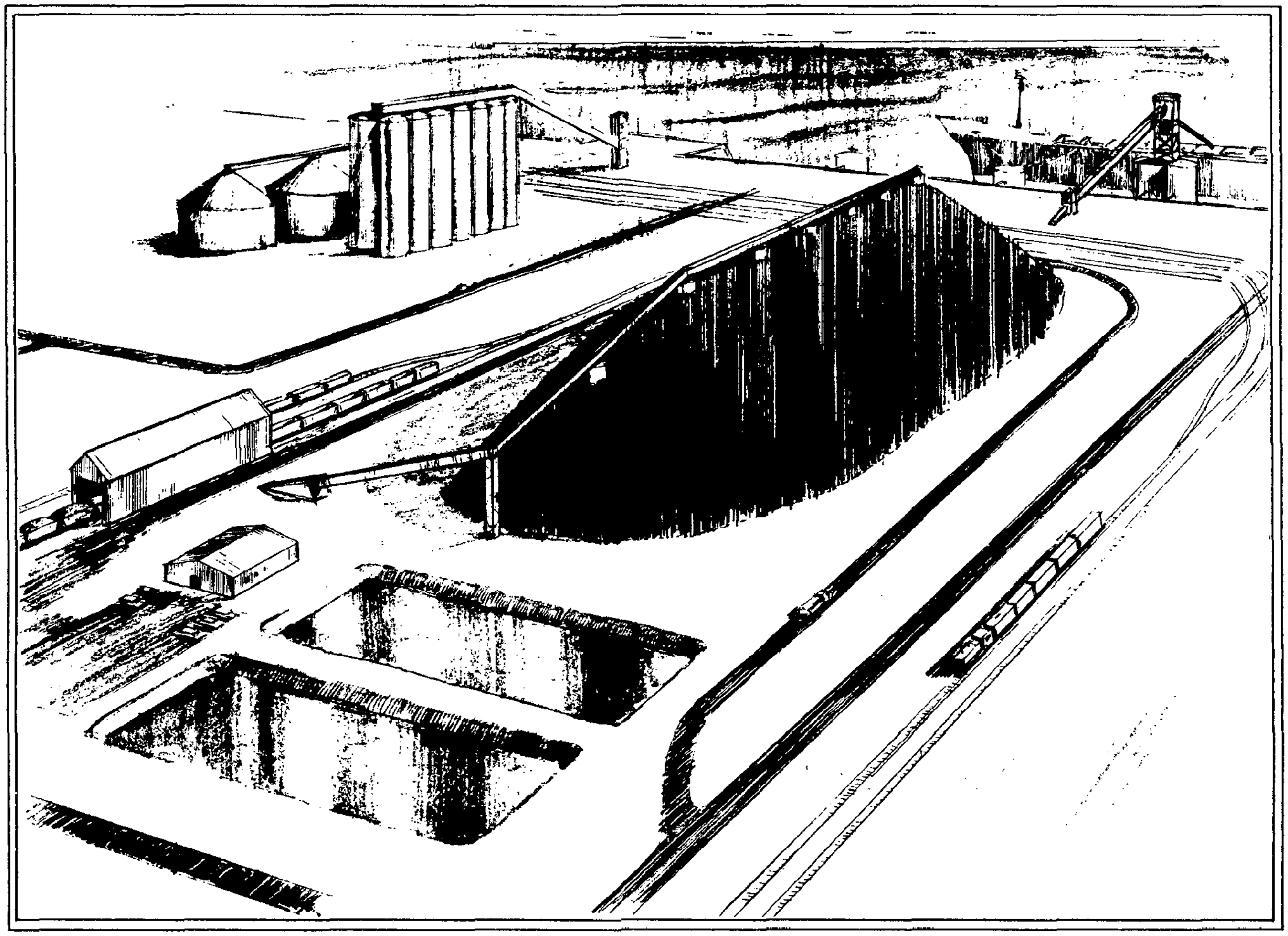
Nancy

BURNS WATERWAY HARBOR EXPORT COAL FEASIBILITY



FINAL STUDY REPORT
PREPARED BY
MOSHMAN ASSOCIATES, INC., WASHINGTON, D. C.
AND
PROFESSIONAL STAFF, INDIANA PORT COMMISSION
OCTOBER 1981

PROJECT INDIANA CZ086-81-01
Grant No. NA-81-AA-DCZ086

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EXPORTS OF ILLINOIS BASIN COAL
THE ECONOMIC FEASIBILITY, ENVIRONMENTAL AND ECONOMIC IMPACTS OF AN INTERMODAL COAL TRANSFER TERMINAL AT PORT OF INDIANA/BURNS WATERWAY HARBOR

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Indiana Port Commission Staff contributing to this study included C. Thomas Bagley and John W. Hughes, port engineers, and Warren P. Thiede; their activities were coordinated and liaison with State agencies was provided by Deputy Port Director James D. Pugh. Port Director Ralph B. Joseph was consulted on policy and operational aspects.

The study secretariat and report typing were the responsibility of Elaine Ivascu; the principal investigator and general study director was David G. Abraham, Vice President and Director of Economic Research of Moshman Associates, Inc.

The views expressed and conclusions reached are those of the authors and do not necessarily reflect those of the Federal and State study sponsors.

ABSTRACT

Based upon critical review of recently completed and published reports, the history, current status, and future outlook for world coal trade and U.S. exports of soft coals were examined.

Coal demand in countries susceptible to supply from the Illinois Basin and to be shipped via the St. Lawrence Seaway system was identified and quantified with forecasts to the year 2000. Availability of suitable coal reserves was examined and for the Illinois and Indiana Counties nearest to Burns Waterway Harbor suitable recoverable reserves were quantified.

Existing and potential future coal export shipping systems were reviewed with emphasis on competing Tidewater ports' economies-of-scale and very large vessel economics, and contrasted with a multi-component Great Lakes shipping system via Indiana's seaport.

Preliminary siting, design, construction, and operating cost estimates for a two to three million annual ton capacity terminal at Burns Waterway Harbor (BWH) were developed, as were total transportation cost estimates. These were compared with competing system costs.

Environmental and economic impacts of the examined coal export operation at BWH were assessed.

Conclusions as to economic feasibility were reached and potentially rewarding actions were suggested.

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I. INTRODUCTION

In accordance with an agreement between the State of Indiana's State Planning Service Agency[1], Indiana Port Commission (IPC), and Moshman Associates, Inc. (MAI), a study was undertaken jointly to assess the economic feasibility of constructing and operating an intermodal coal transfer facility at Burns Waterway Harbor (BWH). Additionally, this study was to assess preliminarily the environmental and economic impacts likely to result from the operations of and related to such a coal transfer operation. The motivating forces for this study are the well publicized, rapidly growing exports of United States coal, on the one hand, and the concommitant congestion at U.S. Tidewater ports, on the other.

In brief, this study seeks to establish, with a reasonable level of reliability, answers to the following basic questions:

1. Will export demand for U.S. steam coal from countries within geographic proximity to the

[1]Transferred to State Department of Natural Resources.

Great Lakes continue for the foreseeable future?

2. Is there a supply of coal available, for export, within a reasonable proximity to Burns Waterway Harbor, and is that coal of suitable quality?

3. Can the suppliers of coal, mined within reasonable proximity to BWH, compete with alternative U.S. suppliers, and what are the competitive effects of exporting coal via BWH as distinct from more easterly located Great Lakes ports and competing Tidewater ports?

4. What kind of an intermodal transfer facility would have to be constructed at BWH to facilitate the exportation of coal; what would be the capital and operating costs of such an intermodal terminal?

5. What will be the economic benefits and the environmental impacts of coal exports via BWH?

6. In the aggregate, what can be said about the prospects for, the benefits and disbenefits of a coal export operation at BWH, and which steps, if any, should be taken and by whom, to implement economically desirable actions?

This report contains the findings obtained from the research undertaken during the months of June-September 1981. In addition, the first chapter, succeeding the report summary following this brief introduction, seeks to provide the reader with a general perspective, some essential background information on coal, its supply and demand posture in the world today and its broadly viewed prospects as one of the critical twentieth century energy materials.

II. SUMMARY OF FINDINGS AND CONCLUSIONS

II. SUMMARY OF FINDINGS AND CONCLUSIONS

The objectives for this somewhat resource- and time-constrained study, as briefly stated in the six questions enumerated in the preceding introduction, have been achieved.

To place the principal concerns of this study-- the economic feasibility and desirability of a coal export operation via the Port of Indiana/Burns Waterway Harbor-- in a proper focus, published data on U.S. coal exports in the past, present, and projectable future were reviewed and described in some detail. The sharp increase in world coal trade projected for the remainder of the Eighties and beyond will be most profound in steam coal shipments; the U.S. is looked upon to fill what would otherwise be a large shortfall in critical energy supplies. The one current problem, raising doubts on this country's ability to become the prominent, reliable, and efficient steam coal supplier, is the apparent shortfall in export shipping capacity at Tidewater ports. Congestion at these intermodal facilities has resulted in lengthy delays in loading of colliers, thereby increasing coal shipping costs to uncompetitive levels. These conditions have given rise to an unprecedented flurry of new coal terminal projects and capacity expansion at existing locations, all with emphasis upon deeper drafts to permit navigation by super-ships in the greater than 50,000 to 60,000 deadweight ton classes of bulk carriers.

Increased U.S. steam coal export prospects, coupled with the problems encountered at Tidewater ports, the desire of the mostly underutilized Great Lakes maritime facilities, labor pools, and midwestern coal mining industry interests to seek additional opportunities have been examined to identify how these interacting phenomena could be positively served.

Eight European countries, so located as to be reasonably, directly accessible via the St. Lawrence Seaway system, with substantial growth in steam coal requirements, were identified. Collectively, these countries' coal requirements to be supplied from U.S. resources are expected to reach almost 20 million tons by 1985 and almost 50 million tons by the end of this century. While most of this demand is for low sulphur, high energy content coals, Illinois Basin reserves contain huge quantities of relatively suitable coals which could be shipped either for direct use in these countries or for blending with coal supplies from other sources.

Very large coal reserves and some active mining operations are located within reasonable proximity to BWH; these coals are produced at competitive prices and some capable producers seem inclined to apply marginal pricing concepts for long-term contracts. Price advantages of $2 to $4 per ton of prepared coal at the mine might be obtainable if satisfactory long-term arrangements can be concluded.

To facilitate the conclusion of such arrangements, it is necessary to put in place a reliable and competitive shipping system. Except for the required intermodal transfer and temporary storage terminal to be developed at BWH, other necessary logistics system components are existing and available for long-term arrangements. Some uncertainty regarding railroad services for BWH exists; these rail services, presently provided exclusively by Conrail, are likely to stablize within the foreseeable future. A Laker feeder service between BWH and St. Lawrence River ports was envisaged and found to be more economical than the use of Seaway-sized Salties which would proceed directly to foreign destinations.

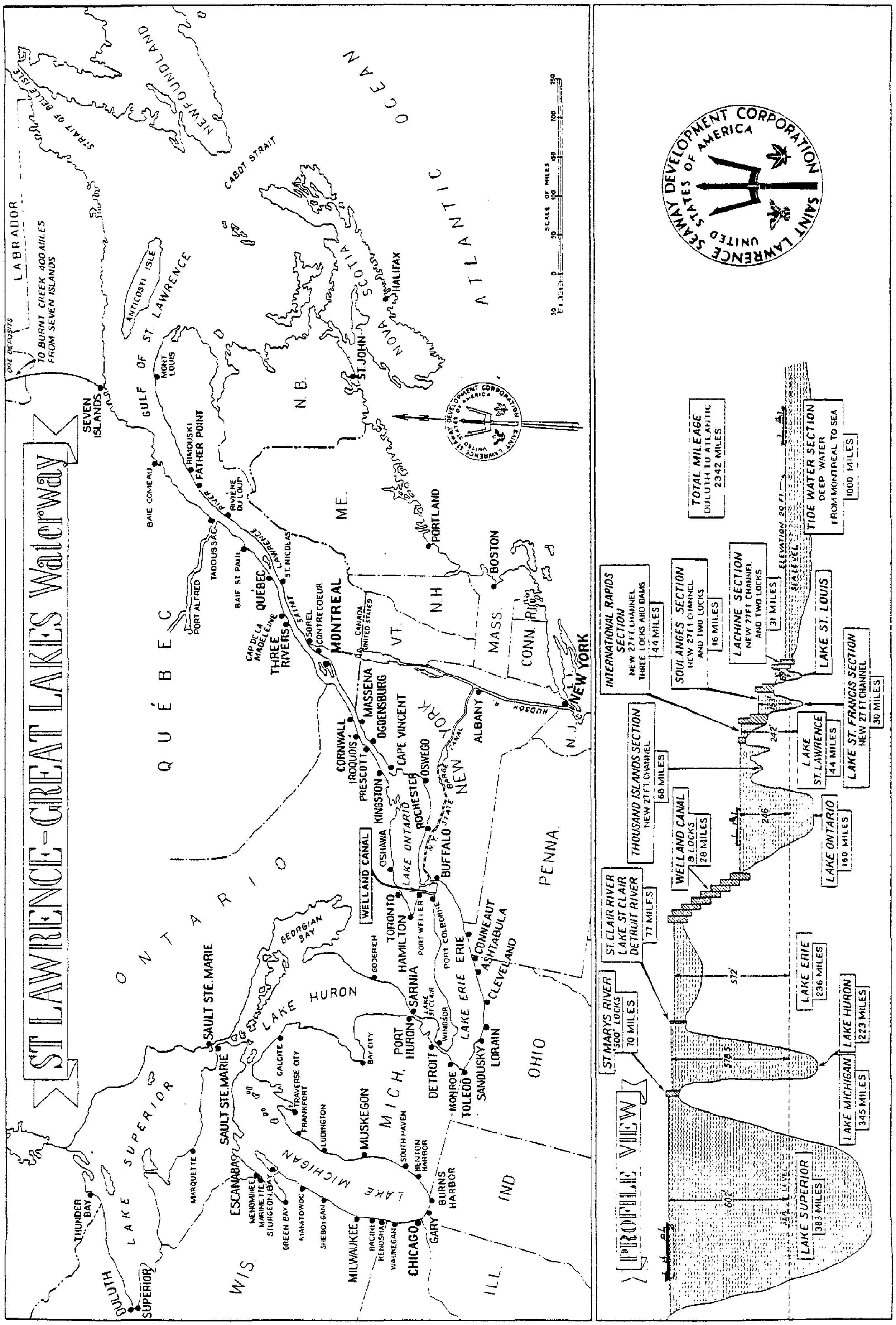
Based on an approximate BWH terminal capital cost of about $9.5 million and an annual throughput of two million tons, an intermodal transfer cost of $1.30 per net ton, in 1981 dollars, was projected. Utilizing in the developed cost model a mine-to-port rail rate of $9 per ton, a feeder vessel rate of $8.50 plus 90¢ in Seaway cargo toll, a St. Lawrence River terminal transfer charge of $3 and an ocean carrier rate of $11 to Rotterdam, a total transport system cost of $33.70 per net ton was estimated. That result was found to be lower than transportation cost estimates from relevant export mines to Rotterdam with exception of the most prominent route from certain Kentucky and other Appalachian origins via Hampton Roads, Virginia, terminals. In our comparisons, including that for the least cost Atlantic Coast system, no allowance for vessel demurrage costs, at present known to amount to $10 per ton or more, was included. Hence, the derived shipping cost estimate via BWH is lower than present-day costs via all but one competing shipping route.

The preliminary terminal siting and layout studies undertaken revealed an opportunity to locate an adequately equipped terminal on a 13-acre site, to obtain an annual throughput capacity of two million tons in a 218-workday shipping season with a possibility of increasing that capacity to as much as three million annual tons through a somewhat extended winter navigation season and extended work week. No adverse environmental impacts are anticipated.

Significant economic benefits would result from this coal export operation. Direct and induced economic impacts were estimated to exceed $40.6 million, at 1981 prices, for a two million annual ton operation; that is as much as 92% of these types of impacts estimated to have occurred from all cargo-related activities at BWH in calendar year 1980.

Indirect impacts attributable to coal mining and preparation were estimated at $162.5 million, just under 70% of such economic impacts attributable to the Indiana Port for 1980.

This study has resulted in generally positive conclusions. Based on presently available information, taking into consideration the Administration's insistence for enactment of legislation requiring users of Federally maintained deepwater shipping channels to pay for all or most operating and maintenance expenses, but not counting on an indefinite continuation of costly congestion at Tidewater ports, the conceptualized transportation system is capable of being competitive. Inevitably, the St. Lawrence-Great Lakes Waterway has the unavoidable disadvantages of a 27-foot channel depth limitation and a less than full year sailing season. While these factors have rendered this vital transportation link less economical for many types of higher valued commodities, the Seaway route, as depicted in the map on the following page, remains a viable bulk cargo shipping system. Coal exports via BWH, similar to those already occurring from several Lake Erie ports, should be able to join the recently initiated successful grain export operation and thereby contribute to the satisfaction of a multi-faceted need, significantly, the supply of a vital fuel material along with the realization


ST LAWRENCE-GREAT LAKES Waterway
PROFILE VIEW
SAINT LAWRENCE SEAWAY DEVELOPMENT CORPORATION
UNITED STATES OF AMERICA
TOTAL MILEAGE
DULUTH TO ATLANTIC
2342 MILES
ST. MARYS RIVER
"500" LOCKS
70 MILES
ST. CLAIR RIVER
LAKE ST. CLAIR
DETROIT RIVER
77 MILES
WELLAND CANAL
8 LOCKS
28 MILES
THOUSAND ISLANDS SECTION
NEW 27 FT. CHANNEL
68 MILES
INTERNATIONAL RAPIDS SECTION
NEW 27 FT. CHANNEL
THREE LOCKS AND DAMS
44 MILES
SOULANGES SECTION
NEW 27 FT. CHANNEL
AND TWO LOCKS
16 MILES
LACHINE SECTION
NEW 27 FT. CHANNEL
AND TWO LOCKS
31 MILES
TIDE WATER SECTION
DEEP WATER
FROM MONTREAL TO SEA
1000 MILES
LAKE SUPERIOR
383 MILES
LAKE MICHIGAN
345 MILES
LAKE HURON
223 MILES
LAKE ERIE
236 MILES
LAKE ONTARIO
180 MILES
LAKE ST. LAWRENCE
44 MILES
LAKE ST. FRANCIS SECTION
NEW 27 FT CHANNEL
30 MILES
LAKE ST. LOUIS
ELEVATION 20 FT.
SEA LEVEL
602'
578.5'
572'
246'
242'
ONTARIO
QUÉBEC
ATLANTIC OCEAN
LABRADOR
NEWFOUNDLAND
GULF OF ST. LAWRENCE
ANTICOSTI ISLE
STRAIT OF BELLE ISLE
CABOT STRAIT
NOVA SCOTIA
N.B.
ME.
N.H.
VT.
MASS.
CONN.
R.I.
NEW YORK
N.J.
PENNA.
OHIO
IND.
ILL.
WIS.
MICH.
ORE DEPOSITS
TO BURNT CREEK 400 MILES FROM SEVEN ISLANDS
SEVEN ISLANDS
MONT LOUIS
RIMOUSKI
FATHER POINT
BAIE COMEAU
RIVIÈRE DU LOUP
TADOUSSAC
PORT ALFRED
BAIE ST. PAUL
QUÉBEC
ST. NICOLAS
CAP DE LA MADELEINE
THREE RIVERS
SOREL
CONTRECOEUR
MONTREAL
CANADA
UNITED STATES
MASSENA
OGDENSBURG
CORNWALL
IROQUOIS
PRESCOTT
CAPE VINCENT
KINGSTON
OSWEGO
ROCHESTER
BUFFALO
ALBANY
NEW YORK
BOSTON
PORTLAND
ST. JOHN
HALIFAX
HUDSON R.
STATE BARGE CANAL
WELLAND CANAL
LAKE ONTARIO
OSHAWA
TORONTO
HAMILTON
PORT WELLER
PORT COLBORNE
CONNEAUT
ASHTABULA
CLEVELAND
LORAIN
SANDUSKY
TOLEDO
MONROE
DETROIT
WINDSOR
LAKE ST. CLAIR
LAKE ERIE
ERIE
SARNIA
PORT HURON
GODERICH
GEORGIAN BAY
LAKE HURON
BAY CITY
SAULT STE. MARIE
CALCITE
TRAVERSE CITY
FRANKFORT
LUDINGTON
MUSKEGON
SOUTH HAVEN
BENTON HARBOR
BURNS HARBOR
GARY
CHICAGO
WAUKEGAN
KENOSHA
RACINE
MILWAUKEE
SHEBOYGAN
MANITOWOC
GREEN BAY
STURGEON BAY
MARINETTE
MENOMINEE
ESCANABA
LAKE MICHIGAN
MARQUETTE
LAKE SUPERIOR
THUNDER BAY
DULUTH
SUPERIOR
SCALE OF MILES
0 50 100 150 200 250

of greatly desired economic opportunities from midwestern coal mines to an eager maritime industry.

This report's authors, gratified to have had the opportunity to undertake this study, express the hope for the earliest possible realization of the opportunities inherent in the development of a coal export terminal at the Port of Indiana/Burns Waterway Harbor.

III. COAL IN THE EIGHTIES AND BEYOND

III. COAL IN THE EIGHTIES AND BEYOND[1]

Worldwide attention on coal as an attractive energy fuel reached new dimensions subsequent to the 1973 oil embargo by certain OPEC members and the incredible increase in world oil prices during the decade of the seventies. That worldwide interest in coal has been tempered by two principal factors: the undesirable environmental effects of coal burning except for relatively low sulphur content coal, and the increasing difficulties encountered in moving desirable coal supplies from mines to overseas points of consumption. Additionally, the sharp increase in coal's price and the long lead-times required to obtain new supplies have also placed some damper on the consumer's enthusiasm for the "brown gold".

III-1. Brief History of U.S. Coal Exports

The United States began exporting coal in the late 1800's. At first the U.S. shipped very small quantities to Canada and, beginning in 1897 and 1898, to the East Coast of South America. Shipments to European countries began on a very limited basis

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[1]Contents of this chapter have been drawn from various sources including the author's intimate familiarity with this subject matter. Among principal sources used are testimony of Carl E. Bagge, President of the National Coal Association before the Subcommittee on Water Resources, Committee on Public Works, U.S. Senate, June 1981, and Coal - Bridge to the Future, Report of the World Coal Study, Ballinger Publishing Company, Boston, Massachusetts, 1980.

in 1902 and these shipments increased gradually until World War I when shipments overseas increased from the 8 million tons per year level to 22 million tons. After the war, exports dropped as fast as they had increased and, with the exception of exports to Canada, remained at very low levels until just after World War II when the United States again emerged as a major coal exporter. World War II left the coal industries of Europe in ruin. As the United States was the only country able to supply the large quantities of coal at the reasonable prices needed for reconstruction of the European economy, U.S. coal exports overseas expanded rapidly to 42.5 million tons in 1947. Additionally, we shipped 26.2 million tons of coal to Canada in that year for a total export of 68.7 million tons. Unfortunately, that level was not reached again until 1957, when exports reached an all time high of 76.4 million tons-- a high that was not again attained until last year when a total of 90 million tons was exported to Canada and to countries overseas.

Traditionally, the United States has exported approximately 9% to 10% of total domestic production. Until 1979, exports of coal were primarily metallurgical coal which is used to make coke to be combined with raw pig iron to make steel. As a result, the levels of coal exports have fluctuated widely and are dependent upon worldwide economic conditions and world steel production levels.

In the 1970's, several factors affecting the demand for U.S. coals overseas exaggerated the traditional cyclicality of the market and caused our export levels to go from an almost all time high of 71 million tons in 1970 to an almost all time low of 40 million tons in 1978. These factors included:

- Full scale entry into the world market of several competitors including Australia, Canada and South Africa (all with lower production cost schedules);

- A mid-1970's decline in the demand for metallurgical coal (coupled with new coal supplies, this meant an oversupply of metallurgical coal worldwide);

- Rapidly increasing transportation and production costs in the 1970's, due in part to meeting various government regulations, which caused the United States to become the highest cost supplier;

- Labor problems primarily in the Appalachian coal fields, in the mid-70's through 1978;

- The United States' failure to participate in the new steam coal market which began to develop in the 1974-75 period, due to an inability to compete in the world steam market on a cost basis.

During the 1970's the markets for U.S. coal shifted and the time required to shift marketing strategies and to penetrate new markets also contributed to the low export levels of 1977 and 1978.

III-2. The Most Recent Past

Forecasts before mid-1979 showed that the United States was not expected to enter the world steam coal market until 1985 or beyond because U.S. coals were not price competitive with those coals available in Poland, South Africa and Australia. It was assumed that supply from these competing countries would more than meet a steadily increasing world demand for steam coal and that the U.S. would continue to participate only marginally in the world market. The year 1980 proved the forecasters wrong as overseas demand for U.S. steam coals became astounding.

In 1980, the United States exported 90 million tons of coal, including 17 million tons to Canada and a record 72.8 million tons to overseas destinations. Shipments overseas included 16 million tons of steam coal (up from zero in 1978 and 2.5 million tons in 1979) and 56.8 million tons of metallurgical coal (as opposed to 24.5 million tons in 1978 and 43 million tons in 1979).

It is important to point out that the 1980 increase in demand for coal was for both metallurgical coal and for steam coal; however, the reasons are somewhat different.

Overseas shipments of metallurgical coal increased in 1980 despite an actual decline in world steel production due to strikes in Australia and the political problems and strikes in Poland.

Overseas shipments of steam coal increased, especially to Europe, due to the aforementioned Australian and Polish labor problems and because:

- Utilities and industrial plants, especially in Europe, are converting from oil to coal as quickly as possible due to the widening price differentials between the two fuels and the continued instability of worldwide oil supplies.

- European coal production has not kept pace with demand from the EEC. European production costs exceed even delivered costs of U.S. coals.

- Marginal supplies of spot coal were unavailable from South Africa as the export capacity of that country was fully committed.

- U.S. coals were more cost competitive and attractive in Europe due to a sharp increase in ocean transportation rates from Australia. More importantly, the United States has a large amount of coal available at competitive prices as the U.S. coal industry currently has excess annual production capacity of over 100 million tons of coal.

III-3. Long Range Outlook for World Coal Use

The increase in coal use worldwide and the resultant increase in world coal trade are not short-term phenomena. Coal is the economical fuel choice of the future. It will supply a greater percentage of world energy requirements in the next decade than in the last 10 to 15 years. For example, in O.E.C.D. countries, coal supplied less than 20% of energy used in 1977, but various forecasts show that coal is expected to supply 22%-24% by 1990, and could supply as much as 30% by the year 2000. In the Centrally Planned Economies, coal currently supplies some 50% of energy requirements. Coal is expected to maintain, if not increase, market share in these nations during the next 20 years.

What do these political commitments, coupled with economic reality, mean for world coal trade?

Two recent reports, Coal -- Bridge to the Future, produced by the World Coal Study team, and the draft report of the Interagency Coal Export Task Force, conclude that coal trade could double by 1990 and triple by the year 2000.

Recently prepared forecasts contain the following import requirements:

TABLE III-1
IMPORT REQUIREMENTS
(Million Short Tons)

	1985			1990		
	Met	Steam	Total	Met	Steam	Total
Europe	39	97-123	136-162	46	146-190	192-236
Pacific Rim	77	43	120	93	90	183
TOTAL	116	140-166	256-282	139	236-280	375-419

The 1985 forecast represents an increase of 115% to 155% for steam coal but a decline of 20% in world met coal imports.

A detailed world export and import projection is contained in Table III-2 on following page.

TABLE III-2

WORLD COAL EXPORTS AND IMPORTS

Country	STEAM COAL 1977 Actual	STEAM COAL 2000 Projected	METALLURGICAL COAL 1977 Actual	METALLURGICAL COAL 2000 Projected	TOTAL COAL 1977 Actual	TOTAL COAL 2000 Projected
	(Million Short Tons)					
EXPORTS						
United States	1	100	53	75	54	175
Poland	20	35	21	22	41	57
Australia	3	100	37	75	40	175
USSR	25	55	0	0	25	55
West Germany	3	0	12	20	15	20
Republic of So. Africa	10	67	2	3	12	70
Canada	1	25	10	15	11	40
All Other	2	83	10	0	12	83
TOTALS	65	465	145	210	210	675
IMPORTS						
Japan	2	69	65	86	67	155
So. Korea	4	76	4	8	8	84
France	16	62	10	14	26	76
Taiwan	3	60	3	6	6	66
Italy	2	34	12	13	14	47
Netherlands	2	30	3	4	5	34
West Germany	9	32	1	0	10	32
Sweden	0	25	2	3	2	28
Brazil	0	0	3	28	3	28
Mexico	1	0	1	20	2	20
Central Planned Economies	19	28	19	27	38	55
All Other	7	49	22	1	29	50
TOTALS	65	465	145	210	210	675

Source: World Coal Study, 1980

From the data in Table III-1, World Coal Exports and Imports, it can be concluded that:

- International steam coal trade, exports and imports, are to increase worldwide from 65 million tons in 1977 to 465 million tons by the year 2000, more than a 7-fold increase;

- Metallurgical coal exports and imports were projected to reach 210 million tons by the turn of the century, a 45% increase from 1977;

- Combined world coal trade would then reach a total of 675 million annual tons, compared with 210 million in the noted base-year, a 3.2-fold increase.

It will be seen on the first data line of Table III-2, that the projected participation of the United States at the end of this century, in this much increased world trade, was estimated to consist of 100 million annual tons of steam coal exports and 75 million tons of metallurgical coal, a total of 175 million tons, compared with 54 million tons, or 30% of the projected figure, in 1977.[1]

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[1] In early September of 1981, the Chairman of the Federal government's Coal Export Task Force reported that in spite of the United Mine Worker's strike early in the year, U.S. coal exports for the first half of 1981 amounted to 14.8 million tons compared with 5.1 million tons exported in the comparable period of 1980.

In conclusion of this overview, we might note that a relatively large number of private- and public-agency forecasts have been prepared in the recent past; we have reviewed a number of these and have noted them in the appended Bibliography. While inevitably, fairly significant differences in both country and worldwide projections have been noted, there is a consensus among the various authors to the effect that significant increases in international coal consumption will take place, continuing the trend of the last several years.

III-4. Comparative Position of the United States in the World Coal Market

The United States has comparative advantage over many other coal producting countries, including those advantages of:

- A coal reserve base large enough to support substantial increases in domestic coal use as well as exports without substantially affecting the price of coal;
- An established, highly competitive coal industry large enough to assure the continued availability of coal for long-term, large-quantity requirements;
- A potential for relative price stability, depending upon government policies;
- Long-term national political stability.

Despite these advantages, the United States has lost market share over the last decade. Over 39% of all coal in world trade originated in the United States in 1970. By 1979, U.S. coal accounted for only 26.2% of world coal trade. During the same time, sharp gains were made by Australia and South Africa.

The Interagency Coal Export Task Force (ICE) of the U.S. Government forecasts that the U.S. share of the world steam coal market could amount to 18% in 1985, 25% in 1990, and 38% in 2000. As seen in Table III-2 (page III-7), the World Coal Study (WOCOL) forecast assigns to the U.S. 26% of total world coal trade and 21% of steam coal exports.

These market shares could be lower, or higher, depending upon:

- Buying strategies of importing countries;
- Maximization of purchases on a least-cost basis;
- Diversification of supply sources for security, price a secondary factor;
- Availability and cost of coal from other nations in relationship to world demand;
- Cost competitiveness of U.S. coals in the European and Far Eastern market;
- Reliability of U.S. supply compared with other sources; and

- Condition of the U.S. logistics systems, with all relevant components for each of the origin points to export port routes, importantly but not limited to congestion at ports and the incidence of ship delays and resulting demurrage charges.

In respect of the last enumerated problem area, progress has been slow, largely due to the incredibly long delays in the Federal permitting process applicable to port and related facilities. Various, so-called "fast track" legislative proposals now pending before the Congress seek to reduce what can be delays of up to 20 years to some reasonable time frame.

In sum, we do not subscribe to the optimistic forecasts suggesting that by 1985 the intolerable delays experienced by colliers at Tidewater ports will be eliminated. We also do not believe that these problems will continue indefinitely. In fact, if this were to be the case, U.S. participation in world coal trade would decline to the pre-1980 levels. Then, vessels were usually not delayed beyond the free-time allowed for loading.

A well reasoned stance suggests considerable relief in the existing intolerable situation will occur within the next couple of years when several new and expanded terminals, presently under construction, will become operational. However, these are not developments which specifically address and would result in facilities capable of loading the so-called Very Large Vessels (VLV's), i.e., ships drawing more than 42 feet to 45 feet of water when fully loaded. Put differently, terminals presently under construction and likely to be permitted for construction in the foreseeable future, including expansion of existing coal export facilities, will <u>not</u> incorporate shipping channels of sufficient depth to permit navigation of fully loaded VLV's, i.e., vessels with more than 90,000 dead weight tons (dwt). In fact, the Norfolk and Western Railway Company's (N&W) Lamberts Point terminal at Norfolk, Virginia, possesses that capacity while all other major Tidewater port facilities are limited to a 42-foot draft.[1]

The net effects of this critical point are:

- Congestion at Tidewater ports is not likely to "disappear" shortly.

- Deployment of VLV's, with capacities of 100,000 to 150,000 dwt, in the U.S. coal export trade is not likely to happen soon. Hence, the economies which would be realized from the deployment of such vessels, especially in the longest trade routes, are not likely to be available and present an additional competitive element for Great Lakes export movements in the near future.

- As will be learned from discussion following later in this report, transfer terminals along the St. Lawrence River, east of Montreal, do have an authorized channel depth of 55 feet at mean low water and are capable of loading vessels in the 140,000 dwt group.

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[1]C&O's Newport News, A.T. Massey's Hampton Roads, and Armco's Hampton Roads terminals have 45' project depths but are generally limited to about 42' draft at all times.

Of course, to be clear, we should re-emphasize that irrespective of the foregoing discussion of U.S. port facilities and the prospects for the relief of terminal congestion, there is every reason to believe in the U.S.'s aggressively increasing share of a growing world coal market.

The reader is referred to Appendix A which contains descriptions of demand, likely sources, and other relevant information for the principal import candidate countries of Belgium, Denmark, France, Germany, Italy, Netherlands, Spain and Sweden.

IV. DEMAND IN COUNTRIES SUSCEPTIBLE TO AND COAL AVAILABLE FOR SUPPLY VIA BURNS WATERWAY HARBOR

IV. DEMAND IN COUNTRIES SUSCEPTIBLE TO and COAL AVAILABLE FOR SUPPLY VIA BURNS WATERWAY HARBOR

Whereas the preceding Chapter III contained, inter alia, a "global overview", and in Appendix A we have provided demand data and other relevant information for eight selected countries, in this Chapter we proceed to zero-in on specific issues which, in the aggregate, will permit the derivation of-- not less than tentative-- answers to this study's focal questions.

IV-1. Demand Side of Equation

In Table IV-1 (following), we present the ICE estimates for U.S. coal supply to the fourteen countries most accessible to supply from the Midwest and which, in total, were projected to have considerable demands for U.S. bituminous coal. The expression of U.S. demand is meant to include, in a comprehensive sense, economic and non-monetary factors such as coal chemistry and political factors. These supply-demand data were prepared during the second half of 1980 (published in January 1981) when Poland was, in fact, expected to continue exporting substantial quantities of bituminous coal.[1] Since then, this situation has changed

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[1]Poland's exports in 1979 were 15.3 million metric tons (mmt) and in 1980 were estimated to have totaled 13.7 mmt. The forecast for 1981 was for 14.4 mmt. Practically nothing but a trickle has been exported by that country this year.

TABLE IV-1

FORECASTS OF UNITED STATES EXPORTS OF STEAM COAL, BY IMPORTING COUNTRY, FOR 1985, 1990, and 2000 FOR COUNTRIES REPRESENTING POSSIBLE GREAT LAKES TRADE

In Millions of Short Tons

	1985			1990			2000		
Country	Low	Mid	High	Low	Mid	High	Low	Mid	High
Austria	0.0	0.7	1.4	0.0	1.0	1.9	— Not Projected —		
Belgium/Luxembourg	2.5	3.2	3.8	2.6	3.9	5.2	4.1	5.3	10.0
Denmark	1.3	1.9	2.5	0.8	2.8	4.8	2.2	2.2	2.2
Finland	0.0	3.2	3.2	1.2	1.7	2.4	1.6	3.3	5 5
France	2,3	3.7	5.5	2.1	4.3	7.3	3.8	9.2	16.1
Greece	0.2	0.6	1.0	0.4	1.8	1.4	0.2	1.0	1.8
Ireland	0.2	0.4	0.7	0.4	0.8	1.2	0.4	1.2	2.1
Italy	3.5	4.3	5.2	3.7	5.9	8.3	6.9	8.8	10.8
Netherlands	0.7	1.3	2.0	0.8	1.9	3.0	1.7	4.4	7.5
Norway	0.1	0.2	0.4	0.1	0.3	0.4	0.5	0.9	1.4
Spain	1.7	2.1	2.4	1.8	2.8	3.7	6.1	6.7	7.3
Sweden	0.0	0.0	0.0	0.0	1.7	3.4	0.0	4.0	8.0
United Kingdom	0.0	0.9	2.4	0.0	2.0	2.4	0.0	1.3	3.1
West Germany	1.2	3.2	6.0	0.6	3.1	7.6	4.3	8.8	14.9
TOTALS	13.7	25.8	36.5	14.4	33.8	52.9	25.8	57.1	90.7

Note: Columns may not add due to rounding.

Source: Tonnages calculated by Moshman Associates, Inc., using U.S. Department of Energy, Interim Report of the Interagency Coal Export Task Force, DOE/FE-0012, Washington, D.C., January 1981, Tables 3-6 and 6-4.

drastically and a European supply void of at least 10 million annual tons prevails; if that situation continues, it would increase the median projections in Table IV-1 by about 40% for 1985, and 30% for 1990.

The eight countries of greatest relevance to BWH are discussed in some detail in Appendix A; these, consisting of Belgium/Luxembourg, Denmark, France, Italy, Netherlands, Spain, Sweden and West Germany, are expected to receive U.S. coal supplies as summarized below (median projections):

Year	Million Net Tons	% Increase From 1985
1985	19.7	-
1990	26.4	34.0
2000	49.4	150.8

It follows that if the supply shortfall, caused by the problems encountered in Poland, were to continue, these substantial figures could be increased by several million tons right now and perhaps as much as seven to eight million tons by 1985. Without question, a rather substantial market exists in western European countries. This market could be and in some it is now reached via a Great Lakes port without causing uneconomic and detrimental circuity, as compared with such other U.S. gateways as the Middle Atlantic and Gulf of Mexico ports.

We noted in Appendix A that practically all of the Western European countries demand a medium to low sulphur (S) content coal, i.e., coal which contains no more than 2.0% to 0.5% (by weight) of sulphur for each pound of 10,000 btu equivalent coal (that means, if a 1% S is required, a 12,500 btu/lb coal would be permitted to have 1.25% S).

Coal meeting that specification is not only in relatively short supply in the "Illinois Basin", but it commands a premium price. However, as noted in the Appendix A notes, low sulphur coal is available to these European buyers from the Appalachian coal suppliers, as well as from Australia and South America. Because these more expensive coals have lesser sulphur content than the average maximum permitted, these coals can be used for blending with a high S content Illinois Basin coal to obtain a suitable, environmentally acceptable blend with an average sulphur content not in excess of that permitted.[1]

IV-2. Supply Side of Equation

Of course, Illinois and Indiana are the two States with substantial coal reserves and production with greatest proximity to BWH. In Tables IV-2 (pages IV-5 and IV-6) and IV-3 (pages IV-7 and IV-8), we have provided coal reserves and production data for each of the two States and their Counties geographically nearest to BWH, for the most recent years for which reliable data, at the county level, are available.

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[1]All other coal specification requirements, such as ash, volatile matter, hardness and moisture content, are readily met by the available Illinois Basin coals.

TABLE IV-2
BITUMINOUS COAL RESERVES
BY METHOD OF MINING AND COAL MEMBERS, AND 1980 PRODUCTION
IN ILLINOIS COUNTIES WITH GREATEST PROXIMITY
TO BURNS WATERWAY HARBOR

In Millions of Net Tons

	1974 RESERVES				
	ALL COAL MEMBERS		LOWER S CONTAINING COAL MEMBER[1]		
Counties	Strippable	Total	Strippable	Total	1980 Production
Proximate Counties:					
Douglas	-0-	719.4	-0-	698.3	2.7
Peoria	642.2	2,946.7	496.2	1,327.0	0.5
Stark	268.0	511.2	268.0	485.4	-0-
Vermilion	146.5	2,420.6	146.5	2,376.0	0.1
Marginal Counties:					
Christian	-0-	4,914.2	-0-	3,491.4	2.9
Fulton	672.0	2,235.5	134.4	306.6	2.8
Knox	519.8	1,721.4	169.1	216.7	0.3
Total Above Counties	2,248.5	15,469.0	1,214.2	8,901.4	9.3
Total State 1980 Production					62.5
Illinois State Totals:					
1974 Reserves	12,223.0	65,665.0			
1979 Demonstrated Reserves	n/a	53,128.0			

Footnotes on following page.

NOTES FOR TABLE IV-2

Note: Columns may not add due to rounding.

[1]Includes Danville No. 1, Herrin No. 6, and Summum No. 4 coal members.

Sources:

Strippable Reserves: Tweworgy, C.G., Bengal, L.E., and Dingwer, A.G. Reserves and Resources of Surface-Minable Coal in Illinois, Illinois State Geological Survey Circular 504, Table 1. 1978.

Total Reserves: Smith, William H. and Stall, John B. Coal and Water Resources for Coal Conversion in Illinois. Illinois State Geological Survey Cooperative Resources Report No. 4, Table C. 1975.

1980 Production: Illinois Department of Mines and Minerals. Illinois Coal Production for 1980 All Mines. 1981.

1979 Demonstrated Reserves: U.S. Department of Energy. Demonstrated Reserve Base of Coal in the United States on January 1, 1979 (DOE/EIA-0280-79). Washington, DC: U.S. Government Printing Office. May 1981.

TABLE IV-3

BITUMINOUS COAL RECOVERABLE RESERVES

BY METHOD OF MINING, AND 1980 PRODUCTION,

IN INDIANA COUNTIES WITH GREATEST PROXIMITY

TO BURNS WATERWAY HARBOR

In Millions of Net Tons

	—1965 RECOVERABLE RESERVES—		
Proximate Counties	Strippable	Total	1980 Production
Clay	323.3	575.7	1.7[1]
Fountain and Warren	32.6	36.2	-[2]
Owen	50.8	50.8	-[2]
Parke	9.6	39.0	-[2]
Vermillion	44.7	340.1	1.5
Vigo	255.6	1,704.9	1.3
Total Above Counties	716.5	2,746.5	4.5
Total State 1980 Production			30.9
Indiana State Totals:			
1965 Recoverable Reserves	2,237.3	17,458.0	
1979 Demonstrated Reserves	1,682.2	10,621.1	

Footnotes on following page.

NOTES FOR TABLE IV-3

Note: Columns may not add due to rounding.

[1]Planned capacity increase over 1980 production for Chinock Mine in Clay County is 0.6 million net tons by 1981. (Keystone Coal Industry Manual, p. 700).

[2]Produced less than 50,000 net tons in 1980.

Sources:

1965 Recoverable Reserves: 1980 Keystone Coal Industry Manual p. 509.

1979 Demonstrated Reserves: U.S. Department of Energy. Demonstrated Reserve Base of Coal in the United States on January 1, 1979 (DOE/EIA 0280-79), p.44. Washington, DC: U.S. Government Printing Office. May 1981.

1980 Production: Indiana Coal Association. Tonnage for Mines Operating in 1980, unpublished data. 1981.

It is evident from these data that very considerable reserves can be tapped if suitable economic conditions would prevail. In the four nearest Illinois Counties, with an average distance of about 200 rail-miles, the strippable reserves of lower S containing coals[1] are shown to be 910.7 million tons while 1980 production in these Counties amounted to a mere 3.3 million tons.

For the six named Indiana Counties, strippable reserves as of 1965 were shown to be 716.5 million tons; present demonstrated reserves are believed to be about 500 million tons and some 20% thereof, or somewhere close to 100 million tons of demonstrated reserves in these Counties, are reported to be of low sulphur (less than 0.6% sulphur per 10,000 btu/lb) quality. These coals, however, are in relatively deep seams and their extraction will require underground mining methods (for which mine development requires larger capital investment than strip mines require and development periods of two to three years, as compared with a year or less for surface and auger mines).

While it is quite evident that production in these Indiana Counties in 1980 was a mere 4.5 million tons, some expanded production was reported for the current year and further capacity expansion is being planned and should be "in place" shortly.

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[1] 2% by weight in situ or less, estimated to average at about 1% sulphur after crushing and washing.

IV-3. Competitiveness of Coal at Mines

Having documented the existence of suitable coal reserves within reasonable proximity of BWH, the question must be raised: Are these coals competitive at the mine? Before answering this question, it is imperative to further define what is meant.

Generally speaking, a coal is understood to be competitive at the mine if it can be produced at a price which is no greater than a comparable coal at another location. Thus for example, if an Illinois medium S coal with an energy content of 11,000 btu/lb is available for, say, $25 per ton at a Douglas County mine, and a similar quality coal is available at a West Kentucky mine for $22 per ton, the Douglas County coal is not competitive at the mine. This, however, is not to say that the more expensive Illinois coal would not be competitive, in fact, it would enjoy a considerable price advantage in the Terre Haute, Indiana market. Conversely, Vigo County (the County whose County seat is Terre Haute) is likely to have an advantage over Douglas County, Illinois coal, assuming the Indiana coal is of approximately similar quality and price at the mine.

Our exploratory contacts with specific producers in the named Counties in both States confirm the competitiveness of these coals at the mine. If anything, the majority of present and prospective producers in these Counties who generously furnished information about their operations, present or prospective, indicated their will and ability to produce coals at competitive or advantageous prices. To be clear, we are persuaded that given appropriate long-term orders (15 years or more), and an acceptable logistics system (from the consignees' viewpoint), suitable coals in annual quantities of two million tons or more could be procured f.o.b. mine, loaded in railcars, at prices of $2 to $4 per ton below competing coal now or prospectively available in other locations with existing or future locational advantages (proximity to assured domestic markets).

In sum, the Illinois and Indiana producers referred to seem willing to employ enlightened marginal pricing concepts. This is an important, possibly critical point, if economic realities, specifically transportation and intermediate handling costs, should be such that some price advantage, at the mine, is needed to obtain competitive landed costs for the Illinois/Indiana coals proposed to be shipped to European markets via BWH.

V. SHIPPING ILLINOIS BASIN COAL TO EXPORT MARKETS, PHYSICAL REQUIREMENTS AND CONSTRAINTS, COMPARATIVE ECONOMICS

V. SHIPPING ILLINOIS BASIN COAL TO EXPORT MARKETS, PHYSICAL REQUIREMENTS AND CONSTRAINTS, COMPARATIVE ECONOMICS

Basic to the resolution whether Illinois Basin coal could reasonably compete in European markets, beyond the questions addressed in preceding Chapters of this report, is a rather complex set of factors, circumstances, and to some extent a number of uncertain developments. All these have some common denominator: the direct and embedded cost for achieving place utility, i.e., any and all costs inherent in moving an acceptable, but not necessarily optimum quality coal from point(s) of production to point(s) of use.

Direct costs include all rates and charges payable for the physical services for movement of coal provided by various entities or vendors; these services encompass intermodal transportation and intramodal transfer including temporary storage. Embedded costs are, for the most part, the cost of money invested in the coal produced and shipped from the time such coal was produced to the time payment therefor is obtained. Because customarily such payment is not forthcoming until shipper is able to present a clean bill of lading, issued by the vessel owner or agent subsequent to completion of loading on the vessel making the final leg of the multi-faceted trip, it is possible for these "inventory carrying costs" to be higher for coal shipped via BWH than for a competing product shipped via other ports.

Our calculations for embedded cost differences show them to be too small to have any effect on marketability or economic feasibility. At a relatively high cost of money of 18% p.a., the incremental inventory carrying cost for the five to ten days transit time in excess over competing routes would be in the range of 10¢ to 20¢ per ton. As noted, we do not believe that such difference would affect the competitive posture and we will henceforth ignore it.

We will focus in this chapter not only on the logistics system requirements for shipment of Illinois/Indiana (IL/IN) coal via BWH but also, to the extent needed for a full understanding, on the existing and probable future shipping systems via East and Gulf Coasts ports.

V-1. Fundamentals of U.S. Coal Export Shipping Systems

V-1.1. The Past

Most U.S. coal is exported through just a few large terminals at major East Coast, Gulf Coast and Great Lakes ports.

The increasing foreign demand for U.S. steam coal has exerted a number of physical, operational, and administrative burdens on existing port-handling capacity.

The facilities designed for metallurgical coal, which requires extensive sorting and blending of coal types, are not as suitable for steam coal. The terminals at Baltimore and Hampton Roads have been operating at near 100% capacity, allowing no margin for errors or mechanical failure.

Historically, the ports of Hampton Roads, Baltimore, Philadelphia, Mobile, and New Orleans have handled almost all of U.S.

coal exports destined for overseas markets. In addition, a number of ports on the Great Lakes have shipped sizable quantities of coal to Canada. Most notable are the facilities at Ashtabula, Conneaut, Sandusky, and Toledo, Ohio. During 1980, two major terminals in Hampton Roads handled 51.8 mmt of export coal, one major terminal in Baltimore handled 12.1 mmt, one in New Orleans 3.8 mmt, and one in Mobile 2.3 mmt. Excluding shipments to Canada, these four ports handled 98% of all export coal as shown in Table V-1. They each operated at full capacity and continued to search for various ways to squeeze out more throughput. The massive 1980 demand for U.S. coal was caused by some unusual factors in other supplier countries-- most notably the labor disputes in Poland, which took that country out of the present export business, and strikes in Australia, which disrupted their production.

Table V-1

U.S. Exports of Bituminous Coal by Port Range

In Thousands of Net Tons

	1976	1977	1978	1979	1980
Hampton Roads	32,000	24,244	15,396	33,753	51,773
Baltimore	6,327	7,055	5,887	9,141	12,124
Philadelphia	447	187	90	55	1,522
New Orleans	1,297	1,432	1,388	1,410	3,826
Mobile	2,755	3,611	1,848	1,284	2,447
Great Lakes	16,580	17,158	15,214	19,140	18,189
TOTAL	59,406	53,687	39,833	64,783	89,881

Source: U.S. Department of Commerce, as reported in National Coal Association, International Coal

Long lines of ships, some waiting for more than two months, are now outside of Baltimore and Hampton Roads harbors. These ships incur demurrage costs of $15,000 to $20,000/day. This situation will probably not continue, but major new terminal capacity-- even on an emergency basis-- is still many months away.

The five major U.S. (East and Gulf) ports are each in the process of expanding existing terminals and constructing new piers, open storage areas, and handling equipment. The proximity to the Appalachian mines, along with the existing rail and equipment infrastructure, has supported the investment at these terminals. The substantial activity at the Chesapeake Bay terminals will probably ensure that they retain an important future role in the coal export trade. Gulf Coast exporting facilities will also be important in the coal export trade, particularly since both barge and rail networks can be used to deliver coal to these ports and can assure inland transport-price competition.

Recent private investments within the coal mining and coal transportation industries have followed from the surge in foreign buying demand. Substantial levels of investments are needed to construct coal-handling terminals, stacker/reclaimer systems, railyard trackage, and support equipment. Few private firms had sought to construct new export facilities during previous decades. Following World War II, demand for U.S. mined coal was fairly stable and the major railroad carriers had met the need for export capacities. Those railroads were the Chessie System, the Norfolk and Western, and Consolidated Rail Corporation (Conrail).

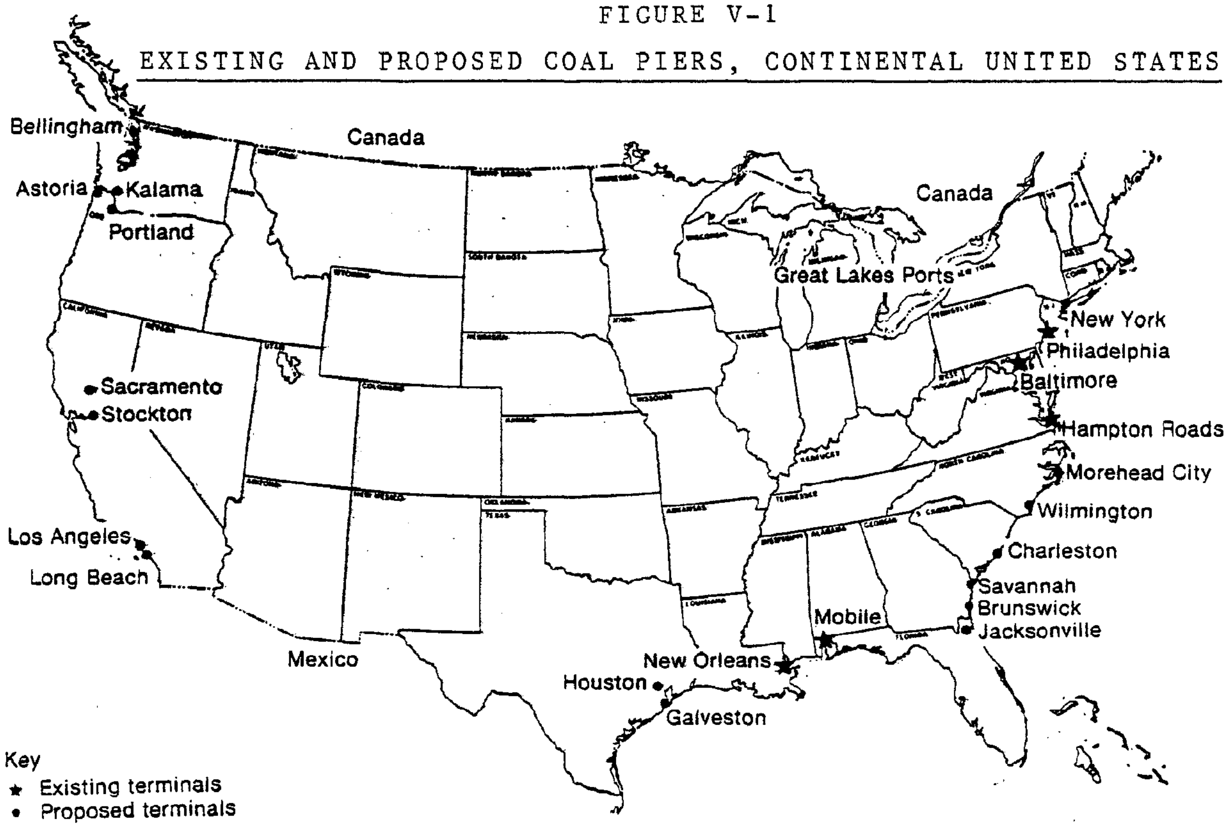
V-1.2. Proposals for New Coal Ports

Ports on the Great Lakes, Atlantic, Gulf, and West Coast are in the process of planning new facilities. In general, proposals for facilities along the Atlantic and Gulf Coasts appear to be advancing more rapidly than those on the Great Lakes or West Coast.

Despite the limited shipping season and 27-foot maximum depth on the Great Lakes, proposals are receiving considerable attention and several projects are moving ahead, most notably Erie, Pennsylvania, Buffalo, New York, and Conneaut, Ohio. Indeed, a major Canadian steamship line will begin to export coal from U.S. ports on the Great Lakes in self-unloaders for transshipment at deeper draft ports on the St. Lawrence River. Figure V-1 illustrates the location of various proposals for coal development around the country and shows major existing terminals.

FIGURE V-1

EXISTING AND PROPOSED COAL PIERS, CONTINENTAL UNITED STATES



SOURCE: Office of Technology Assessment.

Brief descriptions of the existing seven Great Lakes ports capable of transferring coal for domestic or export shipment in an orderly and reasonably economical manner are contained in Appendix B. All Great Lakes, East and West Coast coal ports rely upon the railroads serving them to transport coal from the mines. Only the Gulf ports also receive coal by river barges.

In sum, the Nation's export coal shipping systems are intermodal, and utilize all land- and waterborne modes; relatively inefficient trucks are fulfilling an increasing need for transportation of domestic and export coals from mines to intermodal transfer terminals, for subsequent shipment by rail or by river barges.

As noted before, considerable congestion and costs of delay are the rule at all major Tidewater coal ports. Hence, almost any port with excess capacity is able to participate in the export coal trade, virtually without regard for their geographic proximity and the transportation method employed to transport coal from mine to port.

Still, there is one characteristic which is always of importance, even when the port in question is readily available and the cost of movement of coal to it and the facility's transfer charges are reasonably competitive. That cardinal characteristic is the draft available at that port. Obviously, the available draft at the loading port, and from it to the open waters of the ocean, constrain the size of ship which can be deployed. Size of ship is a critical economic factor, in particular for the Great Lakes maritime industry, for it is limited to the established 27-foot project depth, contrasted with the 42-foot and 45-foot depths at Tidewater ports and which are no longer accepted as sufficient.

This and other economic factors shall be discussed in the section following.

V-2. Economies-of-Scale in Seaborne Coal Trade

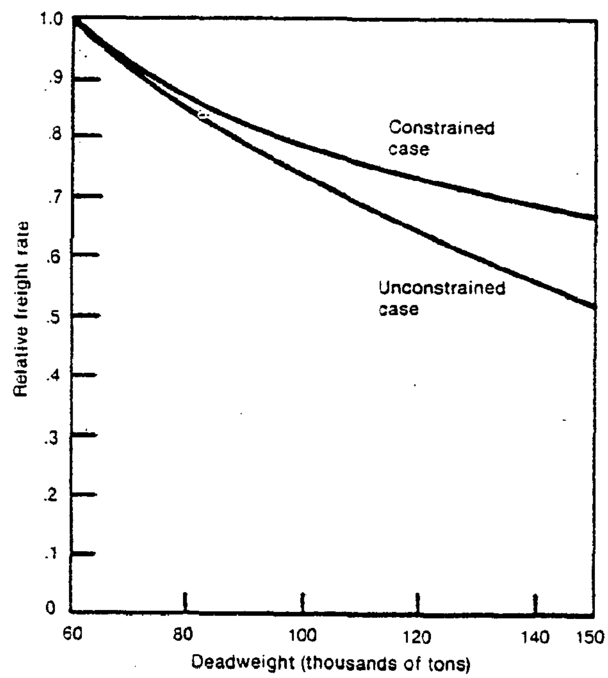
The movement to larger (and faster) seagoing vessels is neither novel nor does that phenomenon differ from the principles inherent in economies-of-scale for other economic activities in general, and in transportation in particular. While liquid bulk carriers employed in world oil trade were and continue to be the pace-setters, vessels designed for the long distance carriage of bulk solids, e.g., grain, ores, coal, etc., have been increased in size such that in 1979 more than one-quarter of the world coal trade was transported in ships with tonnages of 100,000 and over. About 32% of shipments in vessels of this size range originated in the U.S., and more than one-half of all such sized shipments originated in South Africa with the remainder originating at Australian ports.

Importantly, from this study's perspective, only about one-third of the coal trade transported in vessels of 60,000 tons capacity and more were received at European ports. Numerous European ports are not capable of accommodating these large ships so that a market for vessels in the 25,000-ton to 60,000-ton range will continue to exist indefinitely.

That is not to say that an increasingly larger share of the total world trade will seek and benefit from the ocean freight cost reductions achievable with the larger (and faster) vessels. A benchmark measure of the concrete meaning, the savings potential discussed, is visible in Figure V-2 on following page.

FIGURE V-2

ECONOMIES-OF-SCALE IN SEABORNE COAL TRADE



SOURCES: Ran Hettena, in *Critical Issues in Coal Transportation Systems*, 1979.

H. Mellanby Lee, *The Long Run Economics of the Ocean Transport of Coal*, December 1978.

It is seen that under optimistic assumptions (unconstrained case) the relative freight rate for a 150,000 dwt vessel would be about half that for a 60,000 dwt ship. A Hampton Roads-Rotterdam voyage in a 60,000 dwt vessel was estimated to require a rate of about $13.50 per ton and about 75% thereof, or $10.15 for the same in a 110,000 dwt vessel.[1]

These comments, if nothing else, raise serious questions on the economic feasibility of a system which, regardless of the ports it aims to serve, will have one physical constraint, the St. Lawrence Seaway locks and channels, restricting waterborne navigation to a 27-foot draft, and thereby, the deployment of vessels in the 25,000-26,000 dwt class.

V-3. Shipping System Requirements for Illinois/Indiana Coal Exports Via Burns Waterway Harbor

It is correct to think of a system for Illinois or Indiana coals for shipment to a foreign port via a Great Lakes port as a system which parallels an East or West Coast system. Such a system would consist of a mine-to-port movement by railroad, an intermodal transfer, possibly including temporary coal storage, at that port, and a waterborne shipment to destination.

However, our studies (and those of others, including the recent U.S. Maritime Administration report[2]) have revealed that a system incorporating another terminal and a large ocean-going vessel results in lower shipping costs. In fact, what these studies have revealed is that utilization of vessel economies-of-scale for the longest leg of the journey to Europe, say Rotterdam,

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[1]These data from ICF, Inc., October 1980

[2]Great Lakes Ports Coal Handling Capacity and Export Coal Potential, U.S. Department of Commerce, Maritime Administration, Great Lakes Region, December 1980, Revised May 1981.

more than compensates for the cost of an additional intermediate handling, i.e., the unloading of a Laker, assembly of tonnage for a large Saltie, and loading of the latter at the intermediate terminal west of Montreal.

The two systems, with and without an intermediate terminal, for example, the deepwater St. Lawrence River transfer terminals at Quebec or Sept Iles, are sketched in Figure V-3. It will be noted that in addition to the described two alternatives beyond Rotterdam, a barge or small vessel movement is shown for the transportation of coal to such final waterside destinations as Amager and Asneas in Denmark. The point here to remember is that not all destination ports are able to service the 50,000 dwt to 120,000 dwt vessels which are ideally used for the Atlantic Ocean crossing.

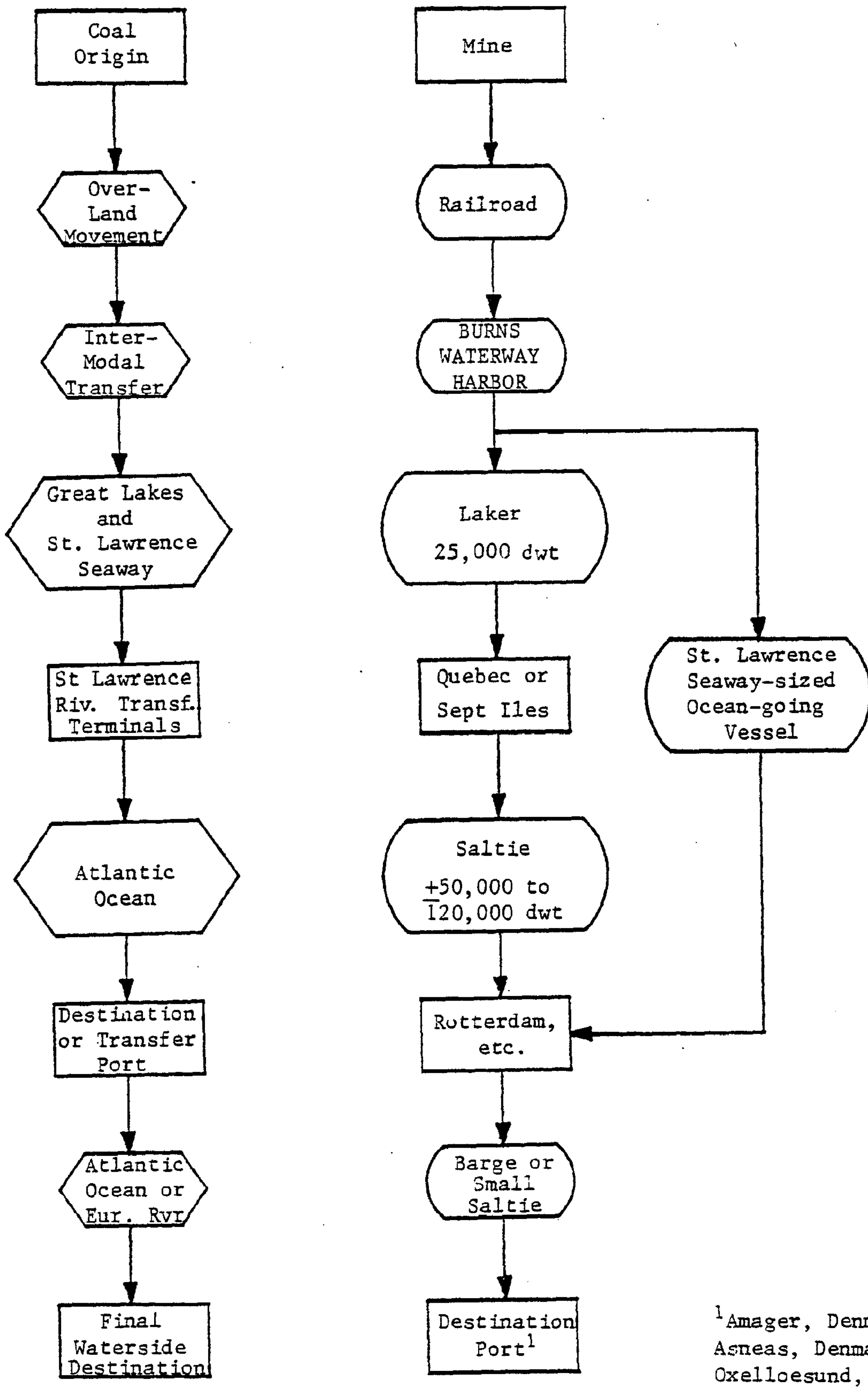
Inherent in the depicted system is yet another alternative, namely, the deployment of regular or self-unloader Lakers. A regular Laker is one which is not equipped with the mechanical apparatus for "self-unloading" of the ship's cargo. While practically all recent construction of Lakers has been in the self-unloader class, there is a shortage of such vessels suitable for transit of the entire Seaway. This is distinct from the giant self-unloader ore carriers which are more than 1,000 feet in overall length (OAL) and are unsuitable for the coal export trade. Notably, the Montreal-Lake Erie section of the Seaway is limited to ships not exceeding 730 feet OAL.

Accordingly, it will be seen that we have based our calculations on the deployment of regular Lakers, Canadian-flag, and the before noted intermediate terminal scheme which was found to result in lower delivered costs than applies to the use of Seaway

FIGURE V-3

SCHEMATIC: COAL TRANSPORTATION SYSTEM

ILLINOIS/INDIANA MINES TO EUROPE VIA BURNS WATERWAY HARBOR



[1] Amager, Denmark, Asneas, Denmark, Oxelloesund, Sweden, etc.

class Salties, topped off at Montreal or east thereof to maximum load capacity.

V-4. Mine-to-Port Transportation

Several railroads serve the Illinois and Indiana Counties with substantial coal resources nearest to BWH. Of these, only Conrail serves BWH directly. Illinois Central Gulf Railroad (ICG) is one of the carriers originating substantial quantities of suitable coal in the Springfield group; ICG has good connections with Conrail.

Of course, due to the absence of export coal movements via BWH, none of the relevant railroads have published rates. Some so-called "paper rates" from points in Indiana do presently exist. These, however, do not apply to 100-car unit-trains, the type of trains which would be used to obtain least cost transportation from mines to the ports.

Projecting rail rates for future high volume coal movements has never been more complex and fraught with uncertainty. The Staggers Rail Act of 1980 has created a whole new set of circumstances which only now are becoming sufficiently understood to conclude that, indeed, projections for rail rates and services are, in this case, subject to considerable imprecision. To be clear, it is one thing to develop projections for well-established rates and services, it is another thing to do the same on a purely synthetic basis. Fundamentally, the difference is that a carrier presently performing a "custom-tailored" unit-train operation knows that traffic's detailed characteristics and, therefore, the carrier is able to measure costs of service reasonably accurately and, in turn, price that service so that it, in fact, produces net revenue at the least price.

We are not saying that all railroads would, indeed, price their service in that manner unless market conditions so dictated. Absent any specific experience, however, no carrier is likely to suggest possible rate levels which do not embody a relatively large cushion for error. In Conrail's precarious condition, it is all the more difficult to project the rates which might be offered as, if, and when export coal shipments via BWH become a reality, when annual minimum tonnage contracts can be entered into, and the critical transportation characteristics-- such as origin loading times, routing, source of car supply, and more-- can be finitely defined.

Nevertheless, it would seem appropriate to suggest that Conrail or any other railroad assuming the former's common carrier obligation would be interested in furnishing a new service-- the large volume coal transportation from its origin points or that of its connecting carrier(s) to BWH-- at rates which contribute to the railroad's net revenue, and which are not so high as to negate the feasibility of the coal movement. Our studies, though not as detailed and painstaking as one would have to perform to develop an optimum price from shippers' and carriers' viewpoints, suggest the feasibility of lawful and desirable rates ranging from a low of about \$8 per net ton to approximately \$14 for joint-line movements from the Springfield-DuQuoin, Illinois, group. The low end of this rate spectrum would apply to a single-line move from Conrail's Sullivan and Brazille

Districts which encompass mines near Terre Haute and as far away as Harrisburg, Illinois.[1]

These rates would be for current levels and would again be subject to increases as of October 1, 1981. However, the same applies to other rail rates also. In fact, with all rail rates taking essentially the same percentage increase and rates to Tidewater ports being as much as $18.75 (Thaker-Phelps, Kentucky to Savannah, Georgia), the periodic rate increases would have the effect of improving the BWH competitive posture.

To be conservative yet realistic in terms of the likely origin points for coal exports via BWH, we shall employ a rail rate of $9 per net ton for this study's purposes.

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[1]Movement from this District would probably require rehabilitation of the presently embargoed Vincennes-Marshall line of Conrail or, alternatively, routing via L&N's Lorain-Evansville line.

V-5. Terminal Transfer

A suitable intermodal transfer terminal, incorporating some temporary storage capability would have to be designed, constructed and operated at BWH to permit the economical receipt of coal from railcars and loading thereof in Lake vessels. Chapter VI contains a detailed description of the preliminarily conceptualized facilities, their location within the Port, the current engineers' capital expenditure estimate and related environmental aspects.

Based on the detailed research undertaken by the Port management and engineering staffs, as described in Chapter VI, Table V-2, following, was developed. This Table reflects current dollar estimates for operating, maintenance, and replacement costs for a two million annual tons operation.

It will be noted that in addition to an estimated total $635,000 for labor, utilities, maintenance, and replacements, we have shown in Line 12 the sum of $1.185 million for depreciation and cost of capital at a 12% rate. Depreciation is based on the "straight line" method for 30 years; the cost of money rate is based on the expected interest rate for a 30-year sinking fund "tax exempt" bond issued by IPC and debt service guaranteed by a high rated corporation.

Also shown in Table V-2, on Lines 13 and 14, are the wharfage, dockage, and harbor charges payable by the terminal operator to IPC and an estimate for insurance, contingencies and reserves, respectively. It is seen that an annual grand total of $2.6 million or $1.30 per ton was estimated. This conservatively

TABLE V-2

ESTIMATE OF OPERATING, MAINTENANCE, AND REPLACEMENT[1] COSTS

ANNUALIZED, TWO MILLION-TON THROUGHPUT

In 1981 Dollars

	Facility Component	Category	Hrly or Annual Rate	Annual Cost Incl. Empl. Beneft. (LABOR)	Fuel, Util.	Maint.	Replace.	Notes -- Comments
1.	Management, Administrative	Superintendent	43,750	43,750	15,000	-	-	Office utilities, stationery, telephone, etc.
		Clerical	17,500	17,500	-	-	-	
2.	Rail, Locomotive, Tracks	Engineer/Brakemen	18/hr	57,600	12,000	18,000	-	Annual operation: 1,600 hrs.
3.	Bulldozer, Loader	Operator	18/hr	46,080	5,120	32,000	30,000	Useful life 20,000 hrs; ann. use 1,280 hrs ea.
4.	Rail Shed	Operator	18/hr	28,800	2,560	1,500	-	Annual operation: 1,600 hrs.
5.	Conveyors	Operator	18/hr	28,800	53,000	10,000	28,000	1 Belt replacement after 15 yrs; Annual operation: 1,600 hrs.
6.	Shiploader	Operator	18/hr	14,400	10,400	5,000	1,250	800 hrs/yr.
7.	Dock	Longshoremen	18/hr	57,600	-	5,000	-	800 hrs/yr, 4 men.
8.	Maintenance, General	Mechanics/Electr.	18/hr	74,880	-	2,500	-	Tools and miscellaneous materials.
9.	Subtotals			369,410	98,080	74,000	59,250	
10.	Contingencies			10,590	11,920	6,000	5,750	
11.	TOTALS			380,000	110,000	80,000	65,000	
11a.	Totals, above four columns combined				635,000			
12.	Depreciation				1,185,000			30-year life, 12% cost of money.
13.	Wharfage, Dockage, Harbor Charge				540,000			20¢, 5¢, and 2¢ per ton, respectively.
14.	Insurances, other Contingencies and Reserves				240,000			
15.	GRAND TOTAL				2,600,000			

[1] Replacement costs provide for replacement of items expected to require same at a date earlier than the facilities assumed useful life of 30 years.

NOTE: Considering the substantial revenue accruing to IPC, no rent was included in operating expense; normally, rent for the land to be encumbered by the proposed terminal would amount to about $60,000 per year, a little more than 10% of the Line 13 Items.

developed estimate results in a rather reasonably priced transfer facility, considering that it would have to be built at present-day costs, as distinct from terminals which were built years ago when construction costs were substantially less. Further, as was noted before, with a modest extension of the St. Lawrence Seaway sailing season and the addition of only one-half shift each operating day, annual throughput could be increased to about three million tons. At that annual tonnage, terminal transfer costs would decline by at least 20¢ per ton and probably by as much as 30¢ per ton.

While we shall employ our conservative $1.30 per ton estimate in our feasibility evaluation, it should be remembered that a lesser charge would ensue from any increased utilization over two million tons of this costly facility.

V-6. Waterborne Transport, BWH to St. Lawrence River Transfer Terminal

In the preceding Section V-3, we discussed, and in Figure V-3 we portrayed, the two types of Lakers and Salties which can be deployed for waterborne transportation, either to a deep-water transfer point east of Montreal or to a destination port on the other side of the Atlantic. While we shall deal with the ocean voyage in Section V-8, suffice it to repeat here, as stated in Section V-3 on page V-9, that the use of Salties from BWH directly to destination does not seem economically desirable.

Even though use of Salties would avoid a costly transfer at a deep-water port east of Montreal, that is not the most economical system. The 4,241 nautical miles (nm) long journey from

BWH to Rotterdam in a vessel with an approximate maximum capacity of 22,000 to 25,000 net tons is not nearly as economical as the use of a Laker with a maximum load capacity of 28,500 tons for the 1,536 nm voyage to Sept Iles or 1,249 nm to Quebec and a 100,000 grt vessel beyond. The Maritime Administration study[1] showed a difference of $7.05 per net ton for the Conneaut, Ohio, to western Europe move. For the same vessel schemes originating at BWH, the difference in favor of the Lake feeder service compared with the use of Salties is bound to be even greater, possibly as much as $8 per net ton.

The two types of Lakers, also already noted, are the regular bulk carrier and the self-unloader. The latter is the more desirable vessel because it is independent of shore installations for cargo unloading. Hence, a self-unloader can unload its cargo anywhere, so long as it can safely tie-up at that location. Such locations can and sometimes do include a midstream transfer from the self-unloader Laker to an ocean-going vessel.

However, for various reasons, at present the economics are in favor of the regular bulk carrier. The principal reason for this situation is the shortage of self-unloaders suitable for transit of the entire Seaway stacked against a high demand for these vessels for the transportation, principally of iron ore from Sept Iles to Lake Erie (and to a lesser extent, Lake Michigan) ports and the return haul of bulk grains. The high level of demand for self-unloaders moves their owners to prefer the shorter voyages to Lake Ontario and Lake Erie ports. Put differently,

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[1]Great Lakes Ports Coal Handling Capacity and Export Coal Potential, U.S. Department of Commerce, Maritime Administration, Great Lakes Region.

self-unloader rates for an 828-nm Sept Iles to Conneaut run may be about $11 per net ton while the additional 136 nm to Toledo could increase the rate by about $1 per net ton and for the additional 708 nm (from Conneaut) to BWH, the difference might be as much as $3 per net ton.

Conversely, for regular Lakers, the rate differences for the additional mileage is not that great and the absolute difference between these vessels' rates plus the cost of transfer at St. Lawrence River ports, including the unloading of regular bulk Lakers is not defeating the advantage regular bulk Lakers enjoy over self-unloaders.

These foregoing statements must be placed in context with two additional factors. One is inherent in the currently prevailing conditions which can be characterized as somewhat slack demand for westbound sailings and a strong demand for eastboung movements of grain, some coke, and coal. The other is the differing attitudes and ratemaking policies of the various vessel operators. Unless one were to enter into a charter party now it is infeasible to say with a high degree of certainty what might be the lowest available rate. Our contacts with several managements have revealed substantial differences in quoted rates for like vessels and services.

For purposes of our analysis, we have chosen use of the rate quoted by an executive for one of the largest Canadian Lakes vessel operators. This rate, for the transportation of coal from BWH to St. Lawrence River ports, is $8.50 per net ton exclusive of the present or actual Seaway toll on the cargo. It is a requirement of this operator to load a full vessel, up to 28,500 net tons, in

12 hours from time of vessel arrival, to unload within 36 hours from arrival at the deep-water terminal, and to surcharge if the average fuel cost at Montreal exceeds $34.82 per bbl.[1] Further, these conditions apply to a consecutive voyage charter for the entire sailing season.

Other conditions quoted include demurrage of $625 per hour and dispatch of $312.50 per hour. It is seen that a 24-hour delay of vessel at BWH or the receiving terminal would cost a whopping $15,000, equal to $0.53 per net ton for a maximum tonnage load. Also, a shipper or consignee desirous of securing availability of vessel tonnage for more than one year would have to accept a multi-year charter contract, with other rate escalators in such a fixture. Finally, we should note the possibility to contract with one operator for the St. Lawrence Seaway and Atlantic Ocean transportation services, including the inevitable intermediate transfer if the more economical Laker-Saltie combination is used. At this time, one large Canadian ship operator has offered a single rate contract for coal exported to the Continent from Conneaut and Ashtabula. This "through service" was quoted at $23 per net ton which is about the same as the sum of the components for Lake feeder service, intermediate terminal services, and the St. Lawrence River to Northern Europe rate. The considerable advantage of this "through service" rate is that it relieves the shipper or consignee of a number of potentially costly risks and assures the

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[1]An interesting sidelight is this operator's determination of fuel's share of the total rate. Fuel was pegged at 12% of the total; that means a $1 increase in the price per barrel causes a 12¢ increase in the quoted freight rate.

availability of intermediate terminal capacity and free storage in the event the ocean vessel is delayed.

Though this Canadian innovator has not evidenced any interest at this time to provide a similarly rated "through service" from BWH, we see no reason such could not be developed with this or another vessel operator.

Regrettably, we must add, the U.S.-flag Laker industry has shown no interest in proposing competitive rates. U.S.-flag Lakers have limited their services to domestic sailings, thus enjoying the protection of the Jones Act (which limits waterborne commerce between U.S. ports to U.S.-flag vessels) and precluding competition from foreign-flag shipping.

As noted above, all rates quoted exclude the St. Lawrence Seaway cargo toll. In line with existing practice, the shipper or charterer will be required to pay actual cargo tolls.

The present cargo toll for a full transit (all Seaway sections) for bulk cargoes including coal is $0.99 per metric ton or about 90¢ per net ton. This rate is presently proposed to increase to $1.10 in 1982 and $1.16 in 1983 ($1 and $1.05, respectively, per net ton). We should emphasize that the present rate for bulk grain is 72¢ per metric ton, about 65.5¢ per net ton, and is proposed to be increased to 79¢ and 83¢ per mt (72¢ and 75.5¢ per nt). Great Lakes maritime interests have long opposed the higher rate for coal which, we concur, is devoid of economic merit. Assuming the proposed rates were to become effective as indicated, the rate difference in 1983 would be 29.5¢ per nt of coal or almost 40% of the grain toll.

V-7. Intermediate Transfer (From Laker to Saltie)

In the preceding Section and in V-3, we discussed the economic advantage of the Laker-Saltie shipping system as compared with the St. Lawrence Seaway suitable ocean-going vessel. Of course, the latter would preclude the need for an intermediate transfer at a deep-water port, or a midstream transfer in deep water.

Midstream transfers are impractical except on those unpredictable occasions when a Laker happens to arrive at the intermediate transfer point and the Saltie coincidentally is also there. If the Laker is not of the self-unloading type, floating bucket cranes would be needed to transfer the coal from Laker to Saltie.

The intermediate transfer component of the multi-faceted shipping system depicted in Figure V-3 (there noted as St. Lawrence River Transfer Terminals), can be an inhibiting problem. At present, there is only a small number of reasonably suitably-equipped terminals east of Montreal. Several of the existing terminals, Contrecoeur and Montreal, for example, have virtually no storage capacity; the best equipped terminals, Quebec and Sept Iles, may soon become congested or restricted to use by one vessel operator.

It should be recognized that with the largest Lakers capable of lifting no more than about 28,500 net tons and the most economical Salties requiring loads of 60,000 tons and more, it is imperative to have terminal facilities available at which suitable quantities of coal for ocean transit can be assembled. Further, if regular, as distinct from self-unloader, Lakers are to be utilized, it is essential to employ a terminal equipped to unload Lakers at a rate of about 800 to 1,000 net tons per hour and having a 24-hour daily operating practice. Finally, this facility must be capable of loading Salties at very rapid rates, generally not less than 4,500 to 5,000 net tons per hour.

The two, well-equipped, above named terminals, Quebec and Sept Iles, are suitable to provide the necessary intermediate transfer services. Conceivably, soon neither of these will be open and available to serve these needs for coal being exported via BWH. One would have to reason, however, that as coal exports via U.S. Great Lakes ports become a matter of long-term reality-- as we envisage they will-- the Canadian maritime industry will seize their opportunities and establish additional suitably equipped terminal facilities, generally in the same manner as is presently the practice along the U.S. middle and southern Atlantic, Gulf, and West Coasts.

Presently quoted rates for the needed intermediate terminal services, from unload to reload, are in the $3 per net ton area and we shall employ that figure in our competitive analysis.

V-8. Ocean Transport

In several preceding Sections, we have noted various aspects of the ocean transport component of the transportation system depicted in Figure V-3. Our emphasis has been on the economies-of-scale as inherent in large vessels. We displayed Figure V-2 on page V-8 showing relative freight rates for vessels of different size, specifically the 60,000 dwt to 150,000 dwt range. We also identified the inevitable economic disadvantage afflicting St. Lawrence Seaway commerce in general and its bulk commodities trade in particular because of the Seaway's draft limitation of 27 feet. Nevertheless, millions of tons of bulk commodities continue to transit the Seaway in both directions. The coal shipping system envisaged by us will avail itself of the economies-of-scale available for the St. Lawrence River to Continental ports leg of the export journey.

The Quebec terminal dock has a draft of 50 feet and east thereof, the 864-mile long section of the St. Lawrence River to the Gulf of St. Lawrence and the Atlantic Ocean channel, depth increases to accommodate the largest ships afloat.

We do not know what the present average freight rate from Sept Iles for a 100,000- to 150,000-ton fixture would be since such large coal parcels have never been shipped and vessel operators have not been asked to quote for same. Moreover, it does not seem really practical that for a two to three million annual tons operation, the 100,000-ton and larger ocean vessel would be deployed.

Contrarily, vessels in the 60,000 dwt to 100,000 dwt class are a distinct possibility for this operation. Their current average rate from the noted St. Lawrence River ports to the Continent, say to Rotterdam, is about $11[1] per net ton, free-in-and-

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[1]The Maritime Administration (MarAd) study used a rate of $12.20 for the Quebec to West Europe voyage in 100,000 dwt ships. Our $11 figure was furnished by two highly reliable and representative large-vessel operators.

out with customary bunker surcharges, if applicable, and usual free times for loading and unloading.

In our Figure V-3 system graphic, we showed an additional "leg" for movement beyond the named port of Rotterdam, the transportation by barge or small Saltie to final waterside destination. Of course, this additional "leg" applies only to destinations, such as the ports named in the Figure, which are unable to berth and unload bulk vessels in the 60,000 dwt to 100,000 dwt size. The additional freight for this "leg" need not be considered here because it would equally apply to coal shipments originating at any other U.S. port at which large vessels can be loaded.

V-9. Transportation System Costs and Comparative Analyses

We divide this last Section of Chapter V into two parts. First, we shall summarize and reflect upon BWH transportation system costs. We shall also note transportation system costs, for coal exports to Rotterdam, as the "benchmark" destination, for shipments of competing coals via other Great Lakes ports, Tidewater ports in the middle and south Atlantic, and the two principal U.S. Gulf of Mexico coal ports. A brief summation of the first two parts of this Section then follows.

V-9.1. Transportation System Costs Via BWH

It would seem appropriate to re-emphasize that all cost or rate data discussed in preceding Sections and presented there and here, are current data essentially as of August-September 1981. Some of these cost figures are susceptible to "overnite" change, others do change periodically but less frequently. For example, on October 1, 1981, all rail rates, excluding only those for which special exemptions apply, will increase by 1.2%. Cost changes could ultimately be of real significance in determining which transport system and route will be most competitive. Experience has shown that during inflationary periods, prices for different products and services do not increase identically. Rail rates, for example, have increased at a substantially greater rate than rates for water transportation. Accordingly, the share of each service's costs in the total system costs can become an important determinant for future competitiveness even when present-day total costs are similar or identical.

Our review of the cost-rate components in the Great Lakes transport system compared with those for the other port ranges suggests a possibly greater vulnerability for the Lakes' system. We shall discuss this matter in some depth in the concluding Chapter.

Table V-3, following, contains a summary of the five cost/rate components comprising the mine to Rotterdam transportation system via BWH. These data are based on utilization of standard bulk Lakers and a St. Lawrence River intermediate terminal for transfer of coal from Lakers to temporary storage, assembly of tonnage required for and loading in large ocean-going vessels. As was noted before, the possible alternative system, employing Seaway-size Salties for the BWH to foreign destination transportation, would result in substantially higher total costs even though the estimated $3 per net ton intermediate terminal

TABLE V-3

COAL TRANSPORTATION SYSTEM COSTS

ILLINOIS BASIN TO ROTTERDAM VIA BWH

	From/To or At	Provider	Sect. Ref. (Source)	Cost/ Rate, US $ Per Net Ton
1.	Mine to BWH	Class I Railroad	V-4	9.00
2.	Rail to Vessel at BWH Incl. Intermediate Storage	BWH Terminal Operator	V-5	1.30
3.	BWH to St. Lawrence River Terminal	Canadian-flag Laker	V-6	8.50 .90[1]
4.	Laker to Saltie, Incl. Intermediate Storage	Canadian Terminal Operator	V-7	3.00
5.	St. Lawrence River to Rotterdam	Foreign-flag Vessel Operator	V-8	11.00
6.	Total Cost/Rates, Mine to Rotterdam	The above	V-4/8	$33.70

[1] Seaway toll for full transit.

charge would be avoided. Put simply, due to the substantially higher ocean freight rate for small vessels, the feeder system postulated is the economical shipping method.

Total transportation costs were estimated at $33.70 per net ton. There should be no doubt that this is indeed a realistic estimate at present-day levels of rates and prices. While the $9 rail rate estimate, one of the three larger components, is not likely to be less, the two vessel rates could be somewhat lower. As previously alluded to, ship charters generally are subject to incorporation of a multitude of complex terms and conditions. Length of charters and ship operators' actual commitments or their perception of future demand for their tonnage can have a major bearing on rates ultimately negotiated between the parties.

A somewhat pessimistic scenario of future foreign traffic prospects for the U.S. Great Lakes ports system would tend to suggest lower potential rates for standard Lakers. Similarly, forecasts of economic activity in EEC countries, in particular the principal coal importers such as France and Italy, do not seem to project great prosperity for bulk ocean-going vessels; hence, the quoted $11 per net ton rate from St. Lawrence River terminals to Europe may also be susceptible to some decrease.

Most importantly, we must examine, at least tentatively, the competitiveness of the Table V-3 total of $33.70 per net ton as compared with the transportation costs from and via competing domestic origins and ports.

V-9.2. Competing Transportation Systems Costs

Lake Erie ports have a distance advantage over BWH; the journey from BWH to Toledo, for example, is 572 nautical miles long and requires an average vessel transit time, under optimum sailing conditions, of about 48 hours. At an indicated hourly vessel cost of $625 the additional sailing time entails an increased cost, over Toledo, of $30,000 or about $1.05 per ton, Can this cost disadvantage be offset by a saving in any other cost component, importantly the mine-to-port rail rate?

The MarAd study previously referred to and containing rates which were effective as of April 30, 1981, indicates a Pennsylvania mine to Conneaut rate of $8.58 per net ton and a Pennsylvania mine to Ashtabula rate of $12.50 per ton; an Ohio mine to Toledo rate of $11.03 per ton is also noted as is a West Virginia mine to Sandusky rate of $13.15 per ton.

These rates cover a range which is from 95% to 146% the $9 per ton rate to BWH which we have used in our model. All that can be said at this juncture is that the rates quoted in the MarAd report would by now have increased by 3.93%, and by 5.2% after October 1, 1981, so that the lowest of these rates would presently be about the same as the projected BWH rate. On average, it is likely that BWH will not enjoy a rail rate advantage over Lake Erie ports of sufficient magnitude to offset fully the Laker freight disadvantage of about $1 per ton. This net difference, however, between a BWH and a Lake Erie transportation system is not believed to be such as to materially affect BWH's competitiveness.

Examination of transportation costs from principal eastern (Appalachian) and midwestern origin points for shipment via Tidewater ports reveals a rather large "spread" with the lowest system costs being several dollars below the Great Lakes estimate and others showing substantially higher costs. In Table V-4 we have documented transportation costs for five representative systems.

It is readily evident that the largest of all coal export facilities, the Norfolk & Western Railway's Lamberts Point (Norfolk, Virginia) terminal, predicated on a 430-mile single line rail haul, shows the lowest system cost. The indicated $31.35 per net ton could be reduced to $30.35 if the approach channel were deepened to accommodate 140,000 dwt vessels. The included port charge of $3.50 per ton is expected to also cover any user fees likely to be legislated in the near future.

Estimated costs at the other end of the spectrum, for shipments via New Orleans and Charleston, may be higher than what they are likely to be for coal originating at mines more suitably located for export via these ports. In any event, it is unlikely that these systems could ever be competitive with transportation costs via BWH or other Great Lakes ports. Of course, that is not to say that these higher cost transportation routes are without merit or economic feasibility. Indeed, these are or will be very successful routes for certain types of coal which have ex-mine price advantages and can, therefore, absorb higher transportation cost without rendering such coal uncompetitive at destination.

At this point we should emphasize that the figures in Table V-4 exclude any "premium" for the cost of congestion at the most popular ports such as the terminals of Hampton Roads. Vessel

TABLE V-4

COAL TRANSPORTATION SYSTEM COSTS, POTENTIALLY COMPETITIVE ORIGINS AND PORT RANGES TO ROTTERDAM

In Dollars per Net Ton

RR-Origin to Port[1]	Rail Rate	Port Charges (Private Facil.)	Ocean Frt	Total Charges
NW-Thacker-Phelps, KT Lamberts Point	13.85	3.50	14.00[3]	31.35[3]
CO-Logan, WV Baltimore	15.55	3.50	15.00[4]	34.05[4]
CO-Big Sandy, VA Charleston	14.67	3.50	24.00[5]	42.17[5]
LN-Scotia, KY Mobile	16.79	2.05	18.00[4]	36.84[4]
LN-Harlan, KY New Orleans	21.63[2]	3.00	18.00[4]	42.63[4]

[1] Mid-1981 single car export rates.

[2] Joint rail-barge movement via Ghent or Louisville, KY.

[3] Estimated to be $1 less if channel dredged to accommodate 140,000 dwt vessels.

[4] Estimated to be $2 less if channel dredged to accommodate 110,000 dwt vessels.

[5] Estimated to be $7 less if channel dredged to accommodate 60,000 dwt vessels.

demurrage at these ports has been as much as $10 and more per ton. It is this congestion, and its cost in terms of vessel and sometimes railcar demurrage, which are the principal motivators for the movement to (i) deepen shipping channels (so that larger colliers can be accommodated, thereby increasing ports' throughput capacity), (ii) construct new and expand shore-side facilities of existing terminals, and (iii) develop entirely new coal export routes and facilities for these, such as the contemplated Great Lakes terminals including BWH.

V-9.3. Summation, Transportation System Costs

It was seen that BWH compared with other Great Lakes facilities, located on Lake Erie, is likely to be at some, albeit small transportation cost disadvantage. The same is seemingly the case when compared with non-congested Hampton Roads and possibly Baltimore terminals. To these determinations it is appropriate to add that for the foreseeable future these Middle Atlantic ports are not likely to become uncongested; more likely, for years to come, heavy demurrage penalties will continue to be seen at these and other Tidewater ports.

As already noted, the geographic and resulting transportation cost advantage of such Great Lakes ports as Toledo and Conneaut are surely not sufficient in size to negate the economic feasibility of the postulated BWH system. The cost difference seen, generally about $1 per net ton in 1981 dollars, might not only be pared but may be compensated for by advantageous ex-mine prices for coal.

In sum, we conclude that based on our herein reflected research the coal export transportation system via BWH gives every appearance of a feasible and competitive system. A note of caution will be expressed, however, in the last Chapter of this report.

VI. PHYSICAL FACILITIES REQUIREMENTS AND CAPITAL COSTS

VI. PHYSICAL FACILITIES REQUIREMENTS AND CAPITAL COSTS

This Chapter reflects the research undertaken principally by the study team engineers. Contained in this Chapter are brief descriptions of the underlying assumptions affecting design parameters, the selected site within the Port complex, the composition of the storage and transfer terminal, dust suppression, and, finally, operating equipment, personnel and capital improvement cost estimates.

It would seem imperative to emphasize that all discussions of annual quantities reflect the brevity of the St. Lawrence Seaway shipping season as, at present, approximately 250 sailing days and 218 workdays, based on a 6-day week. Further, capacity calculations reflect single-shift workdays. What all this means is that expanded throughput capacity would be available as, if, and when the generally much-needed winter navigation[1] is implemented, adding about 30 sailing days or about 12% of present-day capacity. Similarly, throughput capacity could be expanded by adding a second shift on some of the available workdays. Hence, whereas the design discussed in this Chapter and our calculations refer to an annual throughput of two million tons, it follows that if demand justified it, and the additional sailing days became available, it would be quite possible to obtain as much as 50% greater throughput capacity without additional capital investment. If that condition were to ensue, unit depreciation and return-on-

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[1]Winter navigation, as thought of here, is an extension of the traditional sailing season by about 30 days, and not the year-round navigation promoted by some Great Lakes interests. Year-round St. Lawrence River transit has been vigorously opposed by New York State interests on environmental grounds.

investment requirements would decline to two-thirds of the figures reflected in our analyses.

VI-1. Design Parameters

A. All of the coal will be transported to the transfer facility by 100-car unit trains.

B. One unit-train will be delivered each working day and will be unloaded in eight hours.

C. All coal delivered to the facility will have been processed at the mine; no provisions have been made for washing, grading, or crushing coal at the terminal.

D. This transfer facility will have an annual practical throughput of about two million tons and will have a storage capacity of approximately 200,000 tons.

E. Coal will be loaded into Lake vessels, each having a capacity of about 20,000 net tons. A vessel will be loaded in eight hours and a ship will be available every other day. Based on a 250-day shipping season (218 workdays), theoretically it is feasible to obtain up to 2.2 million tons throughput, and at 90% of capacity a throughput of two million tons would ensue.

VI-2. Site Selection

Several areas within the Port were studied as the possible location of this facility. After consideration of all factors, it was determined that the best location for the terminal would be on the eastern half of the riparian fill area of the Port, in an area bounded on the west by the Cargill Grain Terminal, on the north by the Port railroad, on the east by existing open storage areas, and on the south by an existing access road. Drawing SK-1 (which is to be found in Appendix C) shows this location in relation to the entire Port facility. This particular area was selected for the following reasons:

A. In all locations considered, a rail loop capable of accommodating an entire 100-car train was not feasible. The rail layout indicated does not consume large quantities of valuable real estate; this permits the terminal to be located on approximately 13 acres. At all other locations where a rail loop would be necessary and was evaluated, at least 26 acres would be required, of which several acres could not be constructively utilized. By using a switch engine and an automatic car progressioner at the site selected, unit-trains can be handled in 10-car cuts as efficiently at this site as unit-trains could be handled at any other available site. Storage for an entire unit-train will be provided within the Port, at a location approximately 1600 L.F. from the coal terminal.

B. The parcel of land selected for the terminal is well suited for this type of activity. It is long and narrow which is ideal for the straight stretches of rail track required and for constructing a long-storage pile. This parcel is somewhat removed from any dock frontage which would limit its use for the handling of general cargo; however, its location is ideal for handling and storing large quantities of bulk cargo which lend themselves to mechanical conveying for ship-loading.

C. No existing dock frontage would be required. For this facility to function, only several cells would have to be constructed along the bulkhead line of the Outer Harbor; that "stretch" of the bulkhead line is presently an undeveloped section of the Port waterfront. Construction of cells would cost approximately $500,000; this however, is a very modest cost compared with construction costs for an equivalent bulkhead dockwall. Tied-back bulkhead dockwall costs approximately $4,500/L.F., or about $2.7 million for a 600 L.F. berth. All of the other available locations would have required that the ship-loading berth be located at some point along the existing dockwall in the East Harbor Arm. Depending on the type and location of the shiploader, one or two expensive berths would have to be entirely dedicated to the loading of coal. One berth would have been required if a traveling shiploader were to be used and two berths if a stationary loader were to be employed. At the present time, only two full ship berths exist in the East Harbor. These docks are heavily used and equivalent facilities would have to be provided at an estimated cost of $3.2 million to $6.4 million. These figures include provision of lighting, paved apron areas, utilities, and other required services. The cost of providing two additional berths dedicated to coal loading is far greater than the cost of cells and conveying equipment even though the conveying equipment would be of greater length and therefore more costly.

D. The selected location is within an area used almost entirely for the handling of bulk materials; coal in this area will not have any adverse effects on any general cargo handled elsewhere at the Port.

VI-3. Terminal Composition

As previously stated, the coal will be brought to the facility by 100-car unit-trains. The unit-train will be stored on two sidings totaling approximately 5,000 L.F. of track located near the coal terminal. A switch engine, permanently stationed at the terminal, will bring "cuts" of 10 cars each to the rail unloading shed. The engine will leave the 10 loaded cars at this point and continue on to remove the empties of the previous cut to the storage tracks and return with 10 more loaded cars. Cars will be advanced through the rail unloading facility by means of an automatic car progressioner.

The rail unloading shed is of sufficient length to allow continuous movements of cars while being unloaded. Coal falls into hoppers that direct it onto a 72-inch flat belt which delivers the coal to a bin with a flop-gate. The bin can direct the coal to a conveyor that will take it directly to a ship or another conveyor that will take the coal to a storage pile. The equipment in the rail shed is capable of handling coal at the rate of 1,800 tons/hour (tph). Coal designated to be placed directly aboard ship from railcars will be carried from the rail shed to a reclaim conveyor by means of a 48-inch, 1,800 tph underground conveyor. Coal to be stockpiled will be taken by a 48-inch, 1,800 tph conveyor from the rail shed to a transfer point on an overhead stacking conveyor. The stacking conveyor, the same size and capacity of the previous conveyor, carries the coal to seven stacking tubes. At each tube, a device for taking the coal from the belt will be provided. With the exception of the first tube, all stacking tubes will be 90 feet in height. A bulldozer will be "spreading" the coal coming out of the stacking tubes so that a continuous stockpile will be attained. Use of the 'dozer will also provide compaction of the coal which will lower the risk of spontaneous combustion. Coal will be moved from the stockpile to the ship by means of an underground reclaim conveyor. This reclaim conveyor is a 72-inch, 3,500 tph unit which will be fed by several reclaim hoppers located along the tunnel. These hoppers will be equipped with vibrators to help ensure a continuous flow of coal onto the belt. The bulldozer will also be working the stockpile during ship-loading to ensure that coal is continuously supplied to the reclaim hoppers. The reclaim conveyor will discharge onto a shipping conveyor of the same capacity. That shipping conveyor will transport the coal to a ship-loading device while also weighing the coal so transported. This shiploader will be mounted on the mooring cells; it will be stationary. The shuttle conveyor on the shiploader will have the ability to move in and out horizontally, so that the ship can be properly trimmed; it will also be able to move vertically to accommodate different heights of vessels.

It should be emphasized at this point that the conveying system outlined in this study will allow coal to be stacked in the stockpile at the same time coal is being reclaimed for ship-loading. This feature lends a great deal of flexibility to the facility. The cost to provide this degree of flexibility with other types of stacker/reclaimer methods, such as bucket/wheel reclaimer/stackers and crawler mounted stacker/reclaimers, would be prohibitive compared with the described system. To be able to stack and reclaim simultaneously is a desirable feature. For example, it may be necessary to load out coal from the stockpile, to avoid a spontaneous combustion problem, and simultaneously continue unloading unit-trains. Also, if the in-coming coal in a unit-train were of a different grade than that being loaded on a ship, either train unloading or ship-loading would have to stop to prevent the coals from being mixed. A simultaneous stacker/reclaim operation will permit continuous loading of ships and unloading of unit-trains, no matter what circumstances arise (excluding only breakdowns).

VI-4. Environmental Aspects

The places where the most significant quantities of coal dust will be generated are the transfer points, such as the rail shed, where coal is transferred from one conveyor to another, where coal is being placed on the stockpile, and the shiploader during ship-loading.

Dust within the rail shed could be handled with a vacuum system that would collect the dust and deposit it back on the belt for stockpiling.

Modest dust collection systems could be provided at each transfer point or the coal could be sprayed with water to reduce the incidence of dust. The reclaim tunnel is one area that must have a dust collection system. Workmen must be in the tunnel to maintain equipment and to operate the grates on the reclaim hoppers feeding the conveyor. Dust generated during ship-loading can be controlled with a dust collection system on the ship-loader. This dust, once collected, could also be loaded onto the ship. Dust generated during the stockpiling of coal will be controlled to a great extent by the stacking tubes. The stacking tubes provide a significant level of dust control; however, if further control is required, telescoping loading spouts could be provided. Dust produced from the stockpile itself can be controlled by periodically spraying the pile with water or other dust control agents.

The stockpile will be located in an area where the soil contains a large percentage of clay. No special treatment of this soil is necessary to prevent leaching into groundwater. In the event there are not adequate quantities of clay in certain areas within the stockpile, clay is available on-site for proper treatment of the area. Runoff from the stockpile will be directed into ditches which will carry such runoff to a collection pond. Sufficient space is available to provide for two ponds, each capable of containing the waters from a 2-inch rainfall on the stockpile area. One pond can be used for primary settling and the second for final settling. As water passes from the first to the second pond, a feeder can inject lime into the water which will flocculate out the remaining impurities. The water will be carried from the last pond by a storm sewer into the harbor. Each pond will also be equipped with a series of baffles which will accelerate the settling of suspended solids.

VI-5. Operating Equipment and Personnel

Drawing SK-2 (found in Appendix C), entitled Site Plan. reflects the before described terminal facilities; following is an enumeration of the major equipment components and personnel requirements for their operation.

A. Rail: This facility will require that a locomotive be present at all times to move the 10-car cuts back and forth from the storage tracks to the rail shed. A 100-ton locomotive will be required for this operation. A two-man crew will suffice to handle this type of operation.

B. Rail Shed: One man will be required in the rail shed to operate the car progressioner and observe proper operation of the rail cars' hopper doors.

C. Stockpile: It is planned that at least one bulldozer and one front-end loader will be working in the stockpile at all times. When coal is being stacked, the machines must continually work the coal to form the pile. If coal is being loaded on a ship, one or both of the machines must move coal from the outer reaches of the pile to the reclaim hoppers. Two equipment operators would be required for this phase of the operation.

D. Conveyors: One man would be required to operate the conveyors, stacking trippers, and reclaim hoppers.

E. Shiploader: One man is required to operate the shiploader.

F. Maintenance: A minimum of two maintenance personnel will be required for this facility. Regular maintenance is an absolute necessity on the bulldozer and front loader if the facility is to operate efficiently. The locomotive will require attention as well as the conveying systems and shiploader.

G. Office: Only a small office and staff would be required for such a facility. A superintendent or manager is necessary to oversee the entire operation and schedule loading and receiving operations, and one clerk/typist/receptionist. The latter's duties will include record-keeping and collection of weight data from the automated belt-scales.

H. Dockworkers: The longshoremen will probably require a minimum crew of four stevedores to be employed while a ship is docked at the facility. Two linesmen and two trimmers are required for an 8-hour minimum shift.

We estimate that eleven persons will be employed full-time. In addition, allowance must be made for the four stevedores to be employed during ship tie-up, loading, and release from berth.

VI-6. Capital Improvement Costs

The foregoing physical facility description, including all requisite fixed and mobile equipment, has been "translated" to appropriate cost estimates. Inevitably, these estimates are in the category of preliminary engineers' estimates. They do reflect current costs for each of the major items and, in the aggregate, these estimates are believed to be conservative and to contain sufficient reserves for costs of unexpected items or difficulties which might be encountered when detailed engineering, soil borings, and the like, are undertaken.

Table VI-1 contains the capital cost estimate including requirements for the control of dust and contaminated water run-offs.

It is seen that a total of $9.57 million was projected; this equals less than $5 per ton of annual capacity and as such is a relatively low figure for this type and quality of coal transfer facility (about $3.20 per annual ton if this facility were to be used at a 3 million annual tons rate, as noted in the introductory comments to this Chapter).

TABLE VI-1

ESTIMATE OF

CAPITAL IMPROVEMENTS COST

1.	Rail Trackage (does not include storage tracks)	$ 208,000
2.	Automatic Car Progressioner	200,000
3.	Rail Receiving Structure	2,170,000
4.	Tunnel & Conveyor to Reclaim Conveyor	194,000
5.	Tunnel & Conveyor to Stacking Conveyor	225,000
6.	Stacking Tubes	983,000
7.	Stacking Conveyor	450,000
8.	Reclaim Tunnel & Conveyor	1,770,000
9.	Shipping Conveyor to Shiploader	727,000
10.	Shiploader	850,000
11.	Office & Maintenance Structure	140,000
12.	Site Grading	100,000
13.	Roads & Utilities	50,000
14.	Locomotive, 100-ton size	250,000
15.	Bulldozer and Front-end Loader	450,000
16.	Engineering, contingency	433,000
	Subtotal	$9,200,000
17.	Measures to Control Air and Water Pollution (See Detail in Table VI-1a)	370,000
	TOTAL	$9,570,000

Source: IPC Engineering Department.

TABLE VI-1a

ESTIMATE OF

ENVIRONMENT EQUIPMENT COSTS

1.	Dust Collection - Rail Receiving Shed	$ 75,000
2.	Dust Collection at Shiploader	40,000
3.	Dust Collection in Reclaim Tunnel	75,000
4.	Dust Control at 3 Transfer Points	5,000
5.	Construction of Retention Ponds with Baffles	165,000
6.	Chemical Treatment of Runoff	10,000
	TOTAL	$370,000

VII. ENVIRONMENTAL AND ECONOMIC IMPACTS

VII. ENVIRONMENTAL AND ECONOMIC IMPACTS

This Chapter should be recognized as preliminary findings based on the specific research undertaken in this study and reported in preceding Chapters, and a cursory review of relevant literature and previous specific studies, in particular previous economic impact studies for BWH. Expanded, greater in-depth efforts which could have resulted in more definitive findings were not only precluded at this time by budgetary and time constraints but also no need for such is presently evident.

As will be seen, the environmental aspect is believed to be straight-forward; more work on this subject would be required when a final facility design is developed and the necessary local, State, and Federal permits would be applied for. Economic impacts will be influenced by numerous factors including the ultimate configuration of the terminal, the number of people required to operate it, the cost of capital invested, and a myriad of "external" factors.

Knowledge about a public facility's economic impact is crucial for enlightened public policy-making. It is an especially important matter when larger amounts of public funds are proposed to be committed to or for a public facility, the purpose for which is to facilitate satisfaction of a need which cannot be met by the private sector and where such public facility may be unable to pay for itself. This situation always exists when free roads (as distinct from toll facilities) are proposed to be constructed. When investments in public ports are promoted, economists will properly differentiate between such as are needed to serve the entire user universe, such as port roads and rail tracks, and those which facilitate use of the facilities by one or more special user, such as a coal or grain shipper. In the latter cases, productive public policy will require the prospective operation to pay for the specific public investments required, just as would be required if a private investment decision were to be made, and, in addition, a contribution to a return on the general-use investments would be sought. It could be said, a priori, that unless a BWH coal terminal could assure the public agency that it would produce both types of economic results, it would never become a reality. Put simply, agreements with financially responsible entitites would have to assure the repayment of any special public investment such as the estimated terminal construction costs, and a reasonable contribution to the general facility costs, such as is obtained by the public agency from collection of wharfage, dockage, and harbor service fees. Finally, the public agency also should measure the effects of its facilitating activities in terms of direct and indirect economic impacts. Such measures can be developed prospectively as well as retrospectively. Inevitably, only the latter can provide factual information while estimates from the former are useful, as before noted, for general guidance.

In the context of the above introductory discussion, our preliminary findings are presented.

VII-1. Environmental Impacts

Unless spcifically prevented, intermodal transfer of coal screenings results in considerable undesirable and potentially harmful environmental impacts. Undesirable environmental effects would be caused by coal dust escaping into the atmosphere thereby causing particle emissions and pollution of waters due to runoffs caused principally by rainwaters washed off coal stored in open piles while awaiting loading for export shipment. A similar effluent problem can be caused by rainwaters running off loaded railroad cars and conveyors transporting coal among the various places depicted in Appendix C maps.

As to the coal dust problem, it is important to point out that it is of lesser severity here than in some other transfer terminals because coal arriving at BWH will have a relatively high surface moisture. That surface moisture will be a residual from the coal preparation at or near the mine which will have consisted of a crushing and washing operation.

Both the residual coal dust and the polluted effluent problems were addressed in Chapter VI, Section VI-4, and, specifically, Table VI-1a. It is suggested that upon the expenditure of approximately $370,000 for environmental control equipment, its incorporation in the terminal facilities, and the proper operation of such equipment with necessary neutralizing materials, i.e., lime for runoff waters, etc., no adverse environmental effects will result. As mentioned before, the multi-faceted permitting process aims at assuring ultimate compliance with standards developed mostly by the Federal Environmental Protection Agency (EPA), in particular, New Source Performance Standards (NSPS). These contain stringent specifications for suspended solids in the air and dissolved and suspended pollutants in drainage waters.

Our preliminary research results support the expectation that all applicable environmental protection rules can be complied with fully.

VII-2. Economic Impacts

We shall divide our discussions and quantification in three parts, the impacts which would occur at or near the coal mine(s) and those which would occur at the Port. That leaves for the third area the impact caused by rail transportation; obviously, these impacts would occur wherever railroad personnel spend the money they earn from providing a mine-to-port rail service, wherever the railroad makes related expenditures for materials, such as fuel, for services, such as car and engine repair, and for other overheads, such as operations management, billing and collecting, and corporate purchases, such as purchase of equipment, track and track materials, and the like. Also in that third category of impacts away from the Port are indirect expenditures required for insurance, banking services, and expenditures by vessel crews or for their welfare, such as purchase of provisions.

Ultimately, we shall display estimated economic impacts in three economic categories: (i) direct, (ii) induced, and (iii) indirect; the latter will apply exclusively to the commodity-related impact of coal production and preparation.

VII-2.1. Impacts from Coal Mining and Preparation

The minimum value per ton of coal suitable for export shipment via BWH is in the $30 to $35 range (September 1981 prices). Hence, exports of two million annual tons would result in off-site economic impacts of $60 to $70 million.

Most of this coal is likely to be mined in underground mines which have an average labor productivity of 1.3 tons per work hour or 0.769[1] work hours underground per net ton of coal. Above ground services, including coal preparation, is estimated to require an additional 0.699 man-hours per ton of coal suitable for shipment. At a combined labor input of 1.468 work hours per ton at an average labor cost of $11.55 per work hour[2], it is seen that direct earnings impact can be estimated in the range of $17 per ton, or $34 million for the minimum annual volume.

BEA's average multiplier for Illinois Coal Basin is in the 2.5 area, such that total impacts, direct and induced, can be estimated in a range of $150-$175 million. The labor component, as noted, can be estimated to amount to about $85 million or about one-half the total direct and induced impacts. At an average hourly wage cost of $11.55, this labor impact translates to approximately 7.36 million annual work hours, or about 3,540 worker years. Due to the explained locational factor, henceforth these impacts will be noted as "indirect", leaving the distinction of direct and induced impacts for the items following.

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[1]Mine Safety & Health Administration, Information Reports 1976-1978, and National Coal Association.

[2]U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings August 1981, Table C-2, SIC-12, for May 1981, p.72.

VII-2.2. Impact from Rail Transportation and Other Activities Away from Port

It will be recalled (see Table V-3, page V-27) that in our transportation cost model, we utilized an average rail rate of $9 per nt. Multiplied by the two million annual tons minimum, a direct economic impact of $18 million is evident; applying the BEA's surface transportation multiplier of 1.78 results in an estimate of direct and induced economic impacts from rail transportation in the total sum of $32.04 million.

Application of the Association of American Railroads' cost index weights to the above mentioned data, to obtain an approximation of the component division of the estimated impact, the following distribution is derived.

TABLE VII-1

CALCULATION OF RAIL TRANSPORTATION IMPACT BY COMPONENT BASED ON AAR INDEX WEIGHTS[1]

	Item	AAR Index Weights %	Index Weights Applied To Rate	Index Weights Applied to 2 Mil. Annual Tons: Direct	Index Weights Applied to 2 Mil. Annual Tons: Direct Plus Induced
				Millions	
1.	Salaries, Wages & Supplements	49.9	$4.491	$8.982	$15.988
2.	Fuel	9.6	0.864	1.728	3.076
3.	Other Materials & Supplies	12.5	1.125	2.250	4.005
4.	Other Expenses	28.0	2.520	5.040	8.971
5.	Total	100.0	$9.000	$18.000	$32.040

[1] Railroad cost index computed and published by Association of American Railroads; also see ICC proceeding Ex Parte No. 290 (Sub. No. 2), Railroad Cost Recovery.

Other impacts away from the Port consist of those before mentioned, namely crew expenditures, insurance, cargo inspection, and documentation services. Typically, these types of impacts are measured by application of proxies, such as cargo transfer costs and cargo values. Estimates were developed on the basis of considerable research undertaken in prior studies, including economic impact studies for BWH for the calendar years 1977 and 1980. In the absence of more reliable estimates and proxies on which these impacts might be based, we shall calculate as shown below:

		Total Impact	
Item	Basis	Direct	Direct Plus Induced[1]
Crew Expenditures	6% of cargo transfer costs	$156,000	$390,000
Insurance, Banking, etc.	0.8% of cargo value, fob BWH[2]	684,800	1,712,000
TOTAL		$840,800	$2,102,000
Total Per Ton		$0.4204	$1.051

[1]Multiplier of 2.5.

[2]Based on average ex-mine cost of coal @ $32.50/ton plus rail freight $9/ton and rail to vessel transfer cost at BWH of $1.30/ton for a total of $42.80.

Accordingly, the total impacts for economic activities away from the Port and attributable to the export coal movement of two million annual tons, were estimated to be about $18.8 million, $15.3 million, and $34.1 million in direct, induced and combined economic impacts, respectively.

VII-2.3. Impacts at the Port

Total direct impacts at the Port are approximately those which were detailed in Table V-2 on page V-16. The costs shown in that Table at an annual sum of $2.6 million, or $1.30 per ton, do include a number of "external" items such as replacements of equipment or major components, insurance premia, and the like. These types of costs are, for the most part, payable to third parties located away from the Port.

Conversely, in order for the terminal operator to have a financially viable operation, such operator would have to levy a coal transfer fee of not less than $2.06 million for the annual base volume of 2 million tons, equal to $1.03 per net ton plus collection of wharfage and other Port Commission fees (Line 13 of Table V-2) in the amount of $540,000, or 27¢ per ton. Thus, it can be said that the receipt, temporary storage as needed, and loading of coal in vessels are expected to generate economic effects whereby the above noted annual sum of $2.6 million will be "earned" by and from this operation.

On the other hand, the study of economic phenomena, and in particular input-output analysis, has shown that for each dollar locally generated, a larger sum is spent in the community. It could be reasoned that if all the direct impacts generated at the proposed coal terminal were purely local, such as payment of wages and salaries to local labor, the induced impact multiplier would be correspondingly larger.

The BEA's wage multiplier for the South Bend, IN and Chicago, IL areas, weighed at a ratio of 2 to 1, is 2.4825 or rounded to 2.5

times. There being no multiplier available specifically for the area of Portage or Porter County, IN, we apply this weighted average for the two nearest influence areas to obtain the estimate for induced impacts in the amount of $3.9 million ($2.6 million x 1.5) and total direct and induced impacts combined in the amount of $6.5 million.

Recalling once more the data in Table V-2, it can be seen that only about $380,000 in direct wages and benefits will represent new employment income opportunities. That sum equals salaries, wages, and employee benefits for a little more than ten person-years. Besides four year-round employees, another 12 persons, on a seasonal basis, each working about 1,470 hours annually, would find employment opportunities at the coal terminal, albeit the length of employment for these 12 would be less than a full work year.

VII-2.4. Summation, Economic Impacts and Perspective

The economic impacts noted on the following page in Table VII-2 have been identified and explained.

It is seen that as much as $20.32 per ton in direct and induced impacts would be generated from throughput of two million annual tons, or an annual total of $40.6 million in these two impact categories. The direct labor component in this sum was estimated to be $9.4 million plus some portion of direct impacts amounting to an additional $840,000.

Not surprising, the largest impact figure results from coal mining and preparation. This indirect impact estimate of $162.5 million

TABLE VII-2

ESTIMATE OF DIRECT, INDUCED AND INDIRECT
ANNUAL ECONOMIC IMPACTS,
MILLIONS OF 1981 DOLLARS[1]

Item	Direct	Induced	Total Direct and Induced	Indirect	Grand Total
Coal Mining and Preparation	-	-	-	162.50[2]	162.50
Rail Transportation and Other Activities Away from BWH	18.84	15.30	34.14	-	34.14
Intermodal Transfer at BWH	2.60	3.90	6.50	-	6.50
TOTALS	21.44	19.20	40.64	162.50	203.14
Totals per Net Ton	$10.72	$9.60	$20.32	$81.25	$101.57

Source: Preceding sections of this Report Chapter.

[1]Based on minimum annual volume of 2 million net tons.

[2]Based on fob mine average commodity value, times 2.5 multiplier.

reflects use of the well-established BEA Output Multipliers applied to the value of commodities exported; a somewhat smaller or even larger estimate could result, depending on the specific BEA areas, and their multipliers, in which this coal would be mined. The 2.5 times multiplier we used is believed to be appropriate for a mixed urban-rural setting as is typical for the Illinois Basin coal mining areas.

Following is a comparison of these impact estimates with those for all activities at BWH for 1980:

TABLE VII-3

ECONOMIC IMPACT ESTIMATES

	BWH[1] 1980 Impact $ Mil	Coal Terminal Impact $ Mil	Coal Terminal Percent of 1980 Impact
Direct and Induced	44.1	40.64	92.2
Indirect	235.1	162.50	69.1
Totals	279.1	203.1	72.8
Impacts Per Ton of Traffic	$231.6	$101.6	43.9

[1]See Port of Indiana/Burns Waterway Harbor, Economic Impact 1980, Final Report prepared for Indiana Port Commission by Moshman Association, Inc., Washington, D.C., May 1981.

It is seen that the addition of a two million ton annual movemment would contribute to BWH total impacts of as much as 72.8% of the impacts from all tonnages moving through BWH in 1980. In that year, total tonnage at BWH was 1.205 million, about 60% of the base coal volume. However, of that 1980 tonnage, almost 10% was general cargo with a significantly higher unit impact than bulk commodities. That reality is observed in the impact per ton noted above, showing less than 40% for coal compared with the average 1980 BWH traffic.

Regardless of these discerned differences, it is clear: the addition of some $203 million in economic impacts attributable to BWH would be a very substantial positive development.

VIII. CONCLUSIONS

VIII. CONCLUSIONS

Fundamental economic and environmental factors investigated have revealed generally positive conclusions. As this study report is being completed, the National Coal Association projected that overseas exports of coal this year would reach 79 million tons, up from last year's whopping 72 million tons. Significantly, the seven million tons increase for 1981 includes 30 million tons of steam coal compared with 16 million tons last year, a net increase of 21 million tons in that coal category.[1]

In his National Port Week Proclamation[2], President Reagan declared:

> "... Today, our ports are an important resource in the Nation's economy. In 1980, the port industry handled almost two billion short tons of waterborne commerce in foreign and domestic trade. This commerce contributed over $35 billion to the gross national product and generated an additional $1.5 billion in services sold to users.
>
> Recognizing their vital importance to America's economic health, State and local port authorities and private industry have continued to invest financial resources to improve port facilities to meet ever-increasing needs.
>
> The growing demand for coal and other energy sources to fuel the economic growth of the United States and the rest of the industrialized world has presented the ports of this Nation with a unique challenge..." (emphasis added).

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[1]As reported by the American Association of Port Authorities in AAPA Advisory, Vol. XV, No. 40, of October 5, 1981.

[2]The White House, October 2, 1981.

Of course, the focus of this study was BWH's possible future participation in facilitating the growing volume of international coal trade. Before we recap our conclusions, it is useful to take yet another look at the present and future port facilities supply/demand equation.

VIII-1. National Port Assessment

The most comprehensive analysis of future U.S. port requirements ever undertaken was a project completed about a year ago by the Federal Maritime Administration. As stated in this study's report Foreward, the purpose of the effort was "... to assess the capability of the Nation's ports and marine terminal facilities to meet the requirements of U.S. foreign and domestic waterborne commerce foreseen over the next ten years."[1]

It is evident from the data contained in the report's Table 27, reproduced herein as Table VIII-1, that the greatest shortfall of terminal supply is forecast for the Great Lakes. Out of a national berths deficiency, by 1990 of 15, the MarAd study concluded that the Great Lakes would be short eight berths. These, the report's authors projected, would be needed to accommodate the difference between the coal trade projected for the 1990 time frame, 85 million long tons, and the practical capacity in existence in 1975 of 66 million long tons. The forecast for

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[1]National Port Assessment 1980/1990, U.S. Department of Commerce, Maritime Administration, Office of Port and Intermodal Development, June 1980.

TABLE VIII-1

COAL

TERMINAL DEMAND-CAPACITY ANALYSIS

1000 LONG TONS PER YEAR[1]

Coastal Region	Est. Avg. Practical Throughput Capacity (1975)	Foreign and Domestic 2/ Cargo Trade Movements								Est. Shortfalls in Capacity in Terms of No. of Berth Equivalents (1980-1990)
		Actual		Forecast						
		1975	3/	1980	4/	1985	4/	1990	4/	
North Atlantic 5/	63,000	41,706	18	44,676	18	53,888	18	67,079	19	1
South Atlantic (incl. Puerto Rico & Virgin Islands)	-	73	-	102	-	130	-	157	-	-
Gulf	10,136	9,987	14	8,773	14	10,629	15	14,611	20	6
South Pacific (incl. Hawaii)	3,000	35	6	168	6	207	6	253	6	-
North Pacific (incl. Alaska)	-	103	-	103	-	121	-	144	-	-
Great Lakes	65,975	54,768	29	61,065	29	68,641	30	84,748	37	8
Total	142,111	106,672	67	114,887	67	133,616	69	166,992	82	15

1/ All trade and throughput capacity tonnage figures are aggregated by coastal region.

2/ Domestic cargo trade volumes include only oceanborne coastwise, Lakewise, non-contiguous and intra-territory receipts and shipments. Intra-port cargo movements as well as inland waterway traffic are not included.

3/ Number of berthing facilities existing in 1975-1977 with depths of 26 feet and over.

4/ Estimated number of berth equivalents required to meet the 1980, 1985, and 1990 trade forecasts.

5/ Whereas the need for the equivalent of only one additional coal-handling facility in the North Atlantic by 1990 was based on demand/supply conditions and data accumulated from prior years, the recent push to convert oil-burning plants in the U.S. Northeast and Western Europe is expected to translate into a pressing demand for additional coal-handling capability in the U.S. North Atlantic region by the early 1980's, thus surpassing the single-facility requirement predicted for 1990.

1985 indicates that in the Great Lakes, a shortfall, consisting of one berth, will first be felt by 1985 and building up to the stated eight berths by 1990.

Considering the fact that MarAd's National Port Assessment study did not have the benefit of the more recently completed WOCOL and the Interagency Coal Export Task Force's efforts, we can suggest that the MarAd data are likely to be understated. Now, whether the intermodal facility shortfall in the Great Lakes region will suitably be cured by the addition of a two to three million annual ton capacity at BWH is not answered by the MarAd or any other prior study.

VIII-2. Conclusions and Recommended Action

In this Chapter's introduction we stated that generally positive conclusions were reached. Surely, an accessible market of large proportions was identified and quantified; a suitable, albeit not an ideal coal supply was also documented. The transportation system "developed" is practical; except for the BWH terminal facilities, all required components are in place. Transport system costs were conservatively found to be competitive with all but one existing competitor system; the BWH-Rotterdam route would, it was shown, incur substantially lower transportation costs than some of the presently popular routes for coal exports from midwestern origins.

Construction of a suitable intermodal facility would not pose any particularly difficult problems; economical utilization of scarce acreage at BWH is feasible and the very costly construction of a dedicated ship berth can be avoided. No environmental problems are anticipated. Economic impacts would be of very considerable proportions.

In sum, then, both from National and parochial viewpoints, an export coal terminal at BWH would be a very positive development and, at minimum, the actions briefly delineated should be given appropriate attention in the near future.

The concluding cautionary remarks, without which the reader and the potential user of this report could be misled, must deal with two essential components of almost all coal transportation systems, the railroads' services and the ocean-going vessel industry.

In the context of BWH, which obtains railroad services exclusively from Conrail, the railroad problem has two dimensions. One is the uncertain future of that Federally-chartered and taxpayer-subsidized carrier; the other is the railroad industry's general state of flux in ratemaking and transportation contracts, on the one hand, and the increasingly declining regulatory over-sight and consumer protection. What is clear is that rates are bound to rise for some time, proportionately more than rates for other modes' services. Considering that rail rates from origin points to BWH for suitable coals would be relatively less than the rates applicable for other, competing export routes, it follows that the BWH system would obtain additional advantages vis-a-vis these other long rail haul routes. Of course, inordinate rate increases, unchecked by waning regulatory over-sight, can have the effect of rendering the delivered price of U.S. coals uncompetitive in foreign markets.

It is quite beyond us, and probably any analyst, to project

Conrail's future in general and specifically its effects on coal movements to BWH. However, with at least two viable railroad systems available in the area, both of which could be made accessible to the Port, it is quite infeasible that BWH would be left without suitable railroad services.

The ocean-going vessel aspect is, indeed, troublesome. For several years, the overwhelming trend has been to construct increasingly larger, more economical ships, the VLV's which, for the most part, cannot be accommodated at U.S. ports. To "feed" these large ships, a new universe of intermodal transport services was born, largely for general commodities but also for bulk cargoes. These new transport services are chiefly responsible for the decline in Great Lakes tonnage and traffic. One must express some caution for the survivability of all but the most entrenched and irreplaceable Great Lakes waterborne movements. Both a purely economic and a physical problem are of concern. The former is the growing disparity in waterborne shipping costs for VLV's and Seaway-sized vessels; the latter is the future availability of suitable Laker tonnage for the several decades during which a new intermodal coal export facility would have to be amortized.

While this brief study cannot develop quietening answers to the concerns expressed, the overall conclusions must be reached to move forward with actions which will establish the practicability and thereby reconfirm the economic feasibility of the terminal project.

Among these actions one must include the identification of specific foreign customers, specific domestic producers capable of and interested in producing the required coal tonnage at a competitive price; also needed is that "sparkplug" which will initiate and follow through with the establishment of a multi-modal, multi-component transportation system, consisting of a number of providers who are interested in cooperating with each other so that a coordinated system, capable of fulfilling the multi-faceted requirements can be "shown" to the prospective system users. Last, but not least, it is essential to place responsibility for terminal development in the hands of a qualified party so that future users could be assured that no void in this regard will ensue.

While we are keenly mindful of innumerable pitfalls likely to be discovered-- and overcome-- during the course of an action-oriented project pursuit, the many positive factors identified herein and permeating the broad environment suggest a high probability for a successful result. Most importantly, the incontestible need by Western European democracies for greatly increased, secure coal supplies is a powerful motivation to expend the efforts necessary to realize an export coal operation at Burns Waterway Harbor.

APPENDICES

APPENDIX A

IMPORTERS' PLANS and LIKELY SOURCES

COUNTRIES INCLUDED:

- Belgium
- Denmark
- France
- Germany
- Italy
- Netherlands
- Spain
- Sweden

The information in this Appendix has been distilled from various published sources and compiled by the principal author.

APPENDIX A

IMPORTERS' PLANS AND LIKELY SOURCES

In this Appendix, we have summarized import plans, current sources of supply, and infrastructure constraints for the major European coal import countries of specific interest here. A brief narrative description is followed by tabular summary of information on current and planned sources and related data. It will be noted, all tonnages are expressed in STCE.[1] Also, it should be explained that Panamax refers to ships of size suitable to transit the Panama Canal with its 42-foot depth limitation.

Some general comments on the transportation infrastructure in Europe may be helpful. First, a number of excellent deepwater port facilities are available in Denmark, Netherlands, Belgium, France, and Italy, and could be developed in Spain. The countries on the Baltic have ports for relatively shallow-draft vessels (40 feet or less), since the limiting depth at the entrance to the Baltic is 45 feet. Many of the existing coal-fired plants are located on the coasts, e.g., the north German

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[1]STCE: Standard Ton of Coal Equivalent is a metric ton (2,205 lbs.) with a specific heating value of 7,000 Kcal/Kg or 12,600 btu/lb or the equivalent thereof. For example, a TCE for an 11,000 btu/lb coal would be 2,526 lbs. of such coal or 1.263 net tons of such coal.

coast, at Le Havre, on the northeast and northwest coasts of Italy; however, sites for new coastal plants are generally limited. Inland transport has been mainly by barge. An extensive network of barge canals links North Sea ports with the interior of Germany (extending through the Rhine River system to Switzerland), Belgium, Netherlands, and portions of France. Ship-to-barge transfer facilities (some with storage) exist at Hamburg, Amsterdam, Rotterdam, Antwerp, and Ghent, among other ports. Self-propelled canal barges with 1,000-2,000-ton capacity are used in groups of four, except on the Rhine. There are a few inland redistribution centers, mainly along the German Rhine, which have storage capabilities.

Railroad transportation from ports to inland destinations is not practical except in Germany (and perhaps to some extent in Spain), since railroads are usually limited to 30-ton capacity cars and are congested. The Bundesbahn (the German railroad) has been able to establish unit-trains and rates which are competitive with barge traffic.

Of particular importance is the general lack of blending facilities either at ports or at the final destinations. The only probable blending facilities will be at Massvlake (Rotterdam), Hansaport (Hamburg), and perhaps at new facilities planned in Italy and at Gijon (Spain). Blending is important because most importers want coal which contains no more than 1% to 1.6% sulphur. Since much of the South African and Australian coal is substantially below 1%, 2% sulphur coal from the U.S. could conceivably be blended to make up an acceptable mix, e.g., half .5% sulphur plus half 2% sulphur = 1.25% sulphur blend.

(A United States producer of medium-sulphur coal would have to find a consumer with blending facilities or, perhaps, cooperate with a shipper of South African or Australian coal. It might be possible for a U.S. producer to secure a site which could be used for blending and transshipment, e.g., at Algeceras, Taranto, or in the ARA region. Given the cost of blending ($\sim$\$1.50 per ton or so), the U.S. coal would have to be priced at \$3 under the lower sulphur portion of the mix, on a btu equivalent basis.)

BELGIUM

Belgium will become a major importer of coal for utility and industrial use. Coal will be purchased primarily by cooperative purchasing associations established by the utilities and through brokers such as the major German and Dutch brokerage companies. Transportation access is very good via ports at Antwerp and Ghent, and in the Netherlands. Since quality requirements are not rigid, this should be a fairly good market for U.S. coal, especially if medium sulphur coal can be delivered less expensively than low sulphur. Belgium's potential sources of supply are diversified because large ships can be handled at these port facilities.

Country Name:	BELGIUM (including Luxembourg)		
Major Purchasers:	Calorie Pool (cooperative of major utilities)		
Major Brokers:	Various German and Dutch trading companies		
Import Requirements:	1985	1990	2000
Projected Demand	16.5	24.7	41.1
Projected Domestic Production	6.5	6.	5.5
Net Import Requirements	10.0	18.7	35.6
Current Sources:	Poland, others		
Desired Future Sources:	Poland, S.A., U.S. Strong ties to Poland and USSR with barter-type agreements		
Committed Supplies:	Unknown		
Terms of Purchase:	Long-term contract, some spot		
Means of Access:	Ports of Antwerp (90,000 dwt) and Ghent; also by barge or rail from Rotterdam		

Proportion of Receipts:	1985	1990	2000
≤ Panamax	80	70	70
> Panamax	20	30	30

Special Quality Requirements: Substantial stoker coal market.

Notes: Prefers supplier who controls infrastructure; would like to buy on CIF basis

DENMARK

Denmark has been almost totally dependent on Polish coal and is now desperately seeking to fill the shortfall in deliveries from Poland. Overall demand will rise fairly rapidly. The government will not play a heavy role in determining sources of imports. There is good transportation access through new ports which will serve the powerplants directly, and quality specifications are relatively easy. Denmark should be a fairly good market for the United States.

Country Name:	DENMARK		
Major Purchaser:	ELSAM and ELKRAFT--cooperatives of electric utilities		
Major Brokers:	None, prefer to deal direct. Some purchases through German and Dutch firms.		
Import Requirements:	1985	1990	2000
Projected Demand	9.7	12.9	18.5
Projected Domestic Production	0	0	0
Net Import Requirements	9.7	12.9	18.5
Current Sources:	Poland, South Africa		
Desired Future Sources:	S.A., Poland, U.S., Colombia. Disagreement with Poland over Poland's desire for up-front investment in new mines.		
Committed Supplies:	Colombia: 2 mt/y, increasing to 3-4; U.S.: two 10-year contracts, 1.2-1.5 mt/y		
Terms of Purchase:	Long-term contract, direct negotiation, FOB basis		
Means of Access:	Various ports at powerplants. New facilities at Aabearaa and S. Jutland to accept 120,000 dwt vessels. Perhaps lighter to smaller ports.		

Proportion of Receipts:	1985	1990	2000
≤ Panamax	70	50	50
> Panamax	30	50	50

Special Quality Requirements: None

Notes: ELSAM is a knowledgeable buyer; ELKRAFT is new and less experienced

FRANCE

France is now and will continue to be a very large importer. The government dominates coal import and uses policy through control of the State utility (EdF) and a State-monopoly coal purchasing agency (ATIC). France has ties to the coal industries in South Africa and Poland: in South Africa through investments of the French oil company Total, and in Poland through a variety of trade ties. Port facilities are generally good but the major growth area for coal is in industrial use, usually in inland locations where rail or barge access may be somewhat difficult and coal unloading and storage facilities are constrained by lack of space. ATIC is not too enthusiastic about supplies from the U.S. but has been seriously considering opportunities for participation in coal mines for export to France. For this reason, the U.S. may be somewhat attractive.

Country Name:	FRANCE		
Major Purchasers:	ATIC (monopoly of imports)		
Major Brokers:	ATIC has dealt with all major brokers but usually directly with producer		
Import Requirements:	1985	1990	2000
Projected Demand	32.6	35.5	42.7
Projected Domestic Production	16.5	13.	11.
Net Import Requirements	16.1	22.5	31.7[1]
Current Sources:	S.A., Poland, Australia, U.S.		
Desired Future Sources:	S.A., Poland, Australia, U.S. French oil company Total (35% government ownership) heavily involved in S.A. Has bilateral "barter" relationship with Poland. Starting in 1980, 1.43 million tons from Australia on 5-year contracts.		

[1]WOCOL projects 76 million short tons, equal to 60.1 million STCE.

Committed Supplies:	Probable 5 mt/y S.A. coal from Total for 1985, 10 mt/y for 1990. Probable some share of Poland's starting in 1980, 1,430,000 tons from Australia on 5-year contracts.
Terms of Purchase:	3-5 year contracts. Expressed desire for participation via Charbonnages de France but only Total so far. Serious question of financing investment in United States or Australia.
Means of Access:	Ports at Dunkirk, Montoire (50 feet), Bordeaux, Marseille (55 feet), Le Havre (54 feet); also via canals from Antwerp, Ghent, or Rotterdam

Proportion of Receipts:	1985	1990	2000
≤ Panamax	75	60	50
> Panamax	25	40	50

Special Quality Requirements:	Substantial stoker coal market. SO_2 requirements for industrial plants uncertain. Probably shift to high quality away from lowest CIF cost buying.

Notes: Possible that new Mitterand government will force reduction in plans for purchase of S.A. coal. ATIC a highly knowledgeable buyer.

WEST GERMANY

Government influence in the West German coal industry is omnipresent. Imports are limited by the Fifteen Year Law and until 1983 will be controlled through licenses granted to brokers. Historically, German coal imports have been controlled by relatively few brokers with four companies accounting for most of the imports. Even once the licensing system is abolished, the role of these brokers is likely to continue. Poland has a very large debt to Germany and is a very attractive supplier for coal because of access. Hence, Germany is likely to have first call on Polish exports. The difference in Germany's requirements and available coal from Poland will be made up by imports from the U.S. and South Africa. Port access is fairly good through the North Sea ports (at Rotterdam, etc.) for transshipment to coastal vessels or to barges serving plants on the Rhine River systems. There has been some discussion by Ruhrkohle and others of participation in U.S. mines for export to Germany. A recent announcement of the acquisition of 25% of Ashland Coal Company by Saarbergwerke is the first step in this direction.

Country Name:	WEST GERMANY
Major Purchasers:	Various utilities, industries, district heating
Major Brokers:	Until 1986 (phased out starting 1983), established brokers control all imports through licenses. Majors are Stinnes, Klockner & Co., Haniel Trading, and Ruhrkohlen Handel. There are seven other significant brokers. After 1986, consumers may import directly.

Import Requirements:	1985	1990	2000
Projected Demand	66.3	85.3	117.6
Projected Domestic Production	44	44	44
Net Import Requirements	22.3	41.3	73.6

Current Sources: Domestic production, Poland

Desired Future Sources: Poland, S.A. West Germany probably has first call on Polish exports since Poland is easiest and flexible. Weglokoks and several German brokers have a joint-venture company to handle German-Poland trade.

Committed Supplies: Perhaps 1 mt/y of Polish coal is committed through up-front payments. Saarbergwerke has bought 25-percent interest in Ashland, yielding perhaps 1-2 mt/y. Thyssen plans a joint venture with Shell in Australia for 5 mt/y.

Terms of Purchase: Historically spot. Probably switch to medium-term contract. Some participation. Ruhrkohlen has announced its desire to establish participation. Brokers probably will continue to handle 75 percent + of imports.

Means of Access: Rail or coastal vessel from Poland. Hansaport at Hamburg for transfer to barge (110,000 dwt); Wilhelmshaven transfer to rail (125,000 dwt); Rotterdam transfer to Rhine River barge (eventually 150,000 dwt).

Proportion of Receipts:	1985	1990	2000
≤ Panamax	80	70	70
> Panamax	20	30	30

Special Quality Requirements: Substantial market for stoker coal.

Notes: Ruhrkohlen and others which may want to develop U.S., Australian, or S.A. properties/investments may have difficulty since their mandate, as state-owned companies, is controversial

ITALY

Government policies and politics dominate the coal situation in Italy. Coal purchases will be made through the government-owned utility, ENEL, and the government oil company, ENI. Quality requirements are very rigid at 1% sulphur. The Italians have a strong interest in South Africa and Australia. Although they have not participated very substantially, AGIP has one investment in Australia and has just announced a joint-venture agreement with Occidental Petroleum. This agreement will give AGIP a participation in Island Creek Coal Company in the U.S. Overall, there is strong interest in participation in production. Port facilities are being developed which will allow Italy to receive coal in large vessels and hence to diversify the supply.

Country Name:	ITALY		
Major Purchasers:	ENEL (national utility), ENI (national oil producer)		
Major Brokers:	Some U.S. Brokers have long history of met coal trade, e.g., Island Creek Coal sales, but ENEL is likely to buy direct		
Import Requirements:	1985	1990	2000
Projected Demand	19.5	42.6	61.4
Projected Domestic Production	0	0	0
Net Import Requirements	19.5	42.6	61.4[1]
Current Sources:	Poland, S.A., U.S., U.S.S.R		
Desired Future Sources:	Poland, S.A., U.S. Strong interest in S.A.		
Committed Supplies:	Joint venture of AGIP (partly State-owned oil company) and Occidental Petroleum includes four Island Creek coal properties. Has bilateral trade agreements with Poland and U.S.S.R.		

[1]This forecast is 44% higher than WOCOL's (See Table III-2, page III-7).

Terms of Purchase:	Participations via AGIP in U.S., Australia, possibly S.A. Long-term contracts.		
Means of Access:	Existing and new plants to be on coast. Inland transportation poor. Ports now only Panamax. After 1985, one or two major deepwater ports for transshipment to barge or coastal vessel.		
Proportion of Receipts:	1985	1990	2000
≤ Panamax	100	60	50
> Panamax		40	50
Special Quality Requirements:	1 percent sulphur maximum is rigid. New ports will have blending facilities. Ash disposal is likely to be a significant problem. There is also a strong need to maximize plant utilization. Coal use expertise is shallow.		

NETHERLANDS

The Netherlands situation is strongly affected by the presence of Royal Dutch Shell and two long-established coal brokers, which will probably account for most of the imports. Very low sulphur content will be a desirable quality and ash content a substantial problem because ash disposal is difficult. Australian and U.S. coal is likely to find some market, as well as coal from South Africa where Shell participates very heavily in mine and port facilities. Transportation facilities in Rotterdam will allow receipt of coal from large vessels not only for use in the Netherlands but also for transshipment to Germany, Belgium, and France.

Country Name:	NETHERLANDS		
Major Purchasers:	Power companies will set up a cooperative purchasing agency		
Major Brokers:	Royal Dutch Shell, Anker, SHV will control most imports		
Import Requirements:	1985	1990	2000
Projected Demand	6.5	14.0	34.5
Projected Domestic Production	0	0	0
Net Import Requirements	6.5	14.0	34.5
Current Sources:	Poland, S.A., Australia, U.S.		
Desired Future Sources:	Probably will complete up-front payment to Poland to secure 600,000 t/y. Shell's heavy involvement in S.A. will lead to substantial imports, despite political aversion to S.A.		
Committed Supplied:	Poland 600,000 t/y.		
Terms of Purchase:	Prefer to buy CIF basis, long-term contracts. Probably substantial Shell S.A. and Australian coal, and U.S. coal from A.T. Massey.		

Means of Access:	Maasvlake (eventually 200,000 dwt 25 mt/y), Amsterdam, other shallower ports. Powerplants all new, probably locate in or near ports. Dutch ports also serve other European countries.		
Proportion of Receipts:	1985	1990	2000
≤ Panamax	50	30	25
> Panamax	50	70	75
Special Quality Requirements:	Very lowest sulphur available. Ash disposal very difficult; will probably prefer low ash coal.		

Notes: Current coal use very low. Market must develop from scratch. Participation in the Maasvlake coal port in Rotterdam is as follows: Shell 25%, BP 25%, Frans Swarttonee/SHV 20%, Ruhrkohlen/Stinnes 30%.

SPAIN

Government influence in the development of coal use in Spain is very heavy (as it is everywhere in the Spanish economy), but the effort to use more coal is well organized and aggressive. A government purchasing agency, Carboex, has been set up and a parallel private group, Aprocar, was established last year. There is a strong interest in supplies from Colombia (with some commitments near) and from the United States. Several Spanish companies have expressed a desire for financial participation in mine ventures in the United States. Port facilities are being built which will allow economical imports of Australian and South African coal as well.

Country Name:	SPAIN		
Major Purchasers:	Carboex (monopoly for State enterprises), Aprocar (for private consumers). Each controls about 50% of imports.		
Major Brokers:	See above.		
Import Requirements:	1985	1990	2000
Projected Demand	19.3	25.4	64.2
Projected Domestic Production	14.0	7.5	7.5
Net Import Requirements	5.3	17.9	56.7 [1]
Current Sources:	U.S., S.A., Australia		
Desired Future Sources:	S.A., Colombia, U.S., Australia		
Committed Supplies:	Possibly close to commitment with Colombia; probably some commitments to S.A. (seen as low risk).		
Terms of Purchase:	Carboex plans 40% long-term contract, 30% participations, 30% short-term.		

[1] Omitted in Table III-2, the WOCOL projection; U.S. participation, mid-level projection, is 2.1 million, 2.8 million, and 6.7 million net tons for 1985, 1990, and 2000, respectively.

Means of Access:	Gijon (new 200,000 dwt, 2-3 mt/y; transship to rail), Algecira (150,000 dwt, 4-6 mt/y; transship to coastal vessel), Almeria (150,000 dwt, 2-3 mt/y; transship to coastal vessel)		
Proportion of Receipts:	1985	1990	2000
$\leq$ Panamax	70	50	30
> Panamax	30	50	70
Special Quality Requirements:	Possible that new powerplants may have scrubbers		

Notes: Very interested in participations. Both Carboex and Aprocar are new organizations just finding their way along.

SWEDEN

Sweden is and will remain a small market, probably with very tight quality specifications, since sulphur emissions are a major concern. Since port facilities are very poor and restrict transportation to small vessels, Sweden must rely on Poland as a major supplier and perhaps get some coal from the United States.

Country Name:	SWEDEN		
Major Purchasers:	LKAB (subsidiary of State Electricity Board), Sydkraft A.V., and district heating.		
Major Brokers:	None.		
Import Requirements:	1985	1990	2000
Projected Demand	4.0	11.2	26.9
Projected Domestic Production	0	0	0
Net Import Requirements	4.0	11.2	26.9
Current Sources:	Poland		
Desired Future Sources:	Poland, U.S., Australia (S.A. is politically unacceptable).		
Committed Supplies:	Unknown. Exploration program now underway in Mozambique as alternative to S.A.		
Terms of Purchase:	Unknown. Interest in participation in mines now being studied.		
Means of Access:	Shallow Baltic ports (e.g., Oxelsund, the largest, 70-90,000 dwt), good inland rail. Cement plants have own ports. Long-term slight possibility of deepwater port on west coast after 1990.		
Proportion of Receipts:	1985	1990	2000
$\leq$ Panamax			
$>$ Panamax	——	——	——
Special Quality Requirements:	Very low sulphur desirable since SO_2 emissions and acid rain are major political issues.		

APPENDIX B

EXISTING GREAT LAKES COAL PORTS

APPENDIX B

EXISTING GREAT LAKES COAL PORTS

U.S. Great Lakes ports capable of serving intermodal coal movements are generally railroad owned. In 1979, these ports have transferred a total of 41.5 million metric tons; of these, 23.5 million metric tons were domestic movements and 18.0 mmt were exported to Canada. These existing seven ports are briefly described below. It is noteworthy that the ports of Erie and Conneaut began shipping domestic steam coal for overseas exports in 1980. Since then, their export shipments have increased and Toledo has joined them with initial export tonnage.

ASHTABULA, OHIO

Currently handles both steam and metallurgical coal for export to Canada and domestic use. Approximately 75% to 80% is steam coal for Canadian markets. The facility is being modernized and utilizes a 7,000-ton/hr conveyor system for loading vessels. Ground storage is 1.5 mmt and approximately 500 railcars can be stored on site. There is no blending capability and there are no plans for expansion at the present time. A new stacker/reclaimer is planned for 1981.

CONNEAUT, OHIO

This is a modern facility that also was the first to ship coal for export to Europe through a Canadian transshipment facility (Quebec City). An estimated 150,000 tons of steam coal has moved from Conneaut during 1980. The facility does provide a blending service. A conveyor system capable of 7,700 tons/hr loads coal into vessels from a 6-mmt ground storage area. The facility has the capability to increase shipment tonnage without any improvements. There are no plans for expansion in the near future.

ERIE, PENNSYLVANIA

Presently a temporary facility is being used at the port to ship steam coal for domestic use. These coal shipments were initiated in 1980 on a trial basis and 1981 plans indicate an increase in tonnage shipped. The temporary facility is receiving coal by truck from western Pennsylvania mines and has a ground storage capacity of 20,000 tons. Vessels are loaded by conveyor and there is no blending capability. The Erie-Western Pennsylvania Port Authority has received $95,000 from the Commonwealth of Pennsylvania to perform a marketing feasibility and land-use study for a permanent coal-loading facility. This study will be completed in 1981. Additionally, Pennsylvania has passed legislation to secure bonding power for up to $10 million for development of a permanent facility. The results of the study will determine when this development will commence and to what degree.

SANDUSKY, OHIO

Coal shipments consist of 55% for export to Canada and 45% for U.S. domestic users. Approximately 65% to 70% is metallurgical coal with the balance being steam coal. The facility uses a 3,500-ton/hr car dumper for vessel loading and can stage approximately 2,800 railcars. Blending can be accomplished through mixing of railcars. A ground storage capacity of 950,000 tons is also available. This facility is presently dedicated to contract customers. Future expansion is not planned at the present time.

SOUTH CHICAGO, ILLINOIS

This facility has only handled shipments of coke to both Canadian and U.S. domestic customers, although the capability and capacity to ship coal is present. A 5,000-ton/hr-loading rate by two traveling towers provides rapid offloading of railcars. A 1,500-car capacity is available on the site. Barges can also be loaded. Through the mixing of railcars, blending could be accomplished. Expansion for coal handling can be accomplished on the present 40-acre site with little capital cost.

SUPERIOR, WISCONSIN

Currently, Western steam coal for the U.S. domestic market is handled at this facility, which is less than five years old. Railcars are immediately dumped and material is placed into either ground storage or loaded directly onto vessels via an extensive conveyor system. Ground storage capacity is currently

7 mmt and initial design plans allowed for 12 mmt. However, expansion to this capacity will require additional capital investment and is not planned in the near future. The loading rate of 8,500 tons/hr by conveyor is the fastest on the Great Lakes. Blending can be accomplished by controlling the underground reclaimer plow feeders if required. Vessel size is limited to seaway-size vessels.

TOLEDO, OHIO

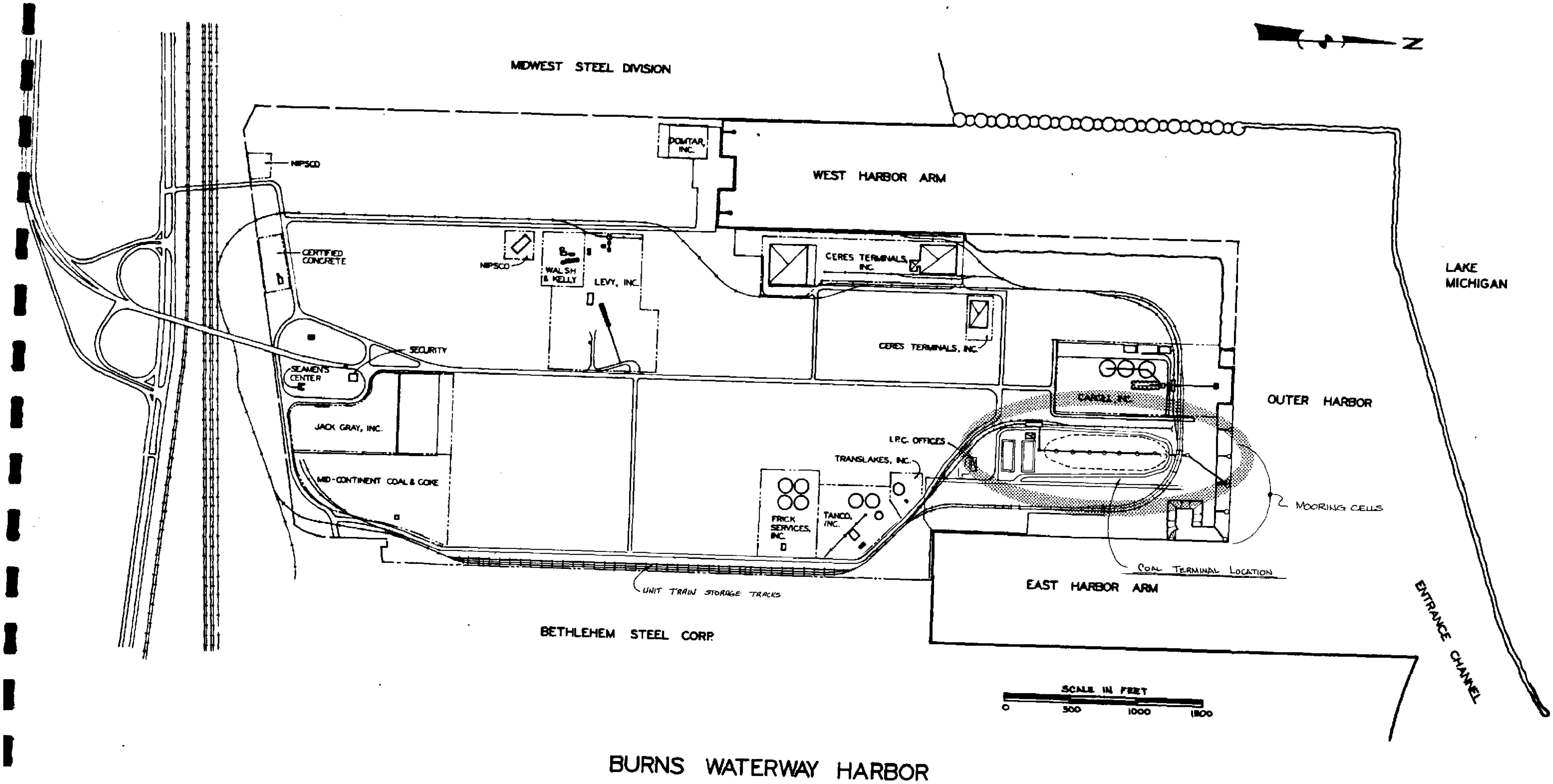
There are four separate loading berths at the facility. Coal shipments are 60% steam and 40% metallurgical coal and are primarily destined for the U.S. domestic market with only some shipments to Canada. One berth (east pier No. 4), uses a 4,500-ton/hr conveyor for vessel loading. The other three berths use an 1,800-ton/hr car dumper. Berth east side No. 1 has not been used for the past eight years although it can be operated if needed. These three berths are limited to seaway-size vessels. The facility does not have any ground storage capacity but can accommodate approximately 5,000 railcars. Blending can be accomplished through mixing of railcars. Currently, there are no plans for future expansion. If demand requires, the inactive berth can be operational with little, if any, capital investment. In 1965 and 1966, Toledo moved 34.8 mmt and 34.3 mmt.

As noted on page B-2, Toledo recently began coal shipments to overseas markets with transshipment at Canadian St. Lawrence River facilities.

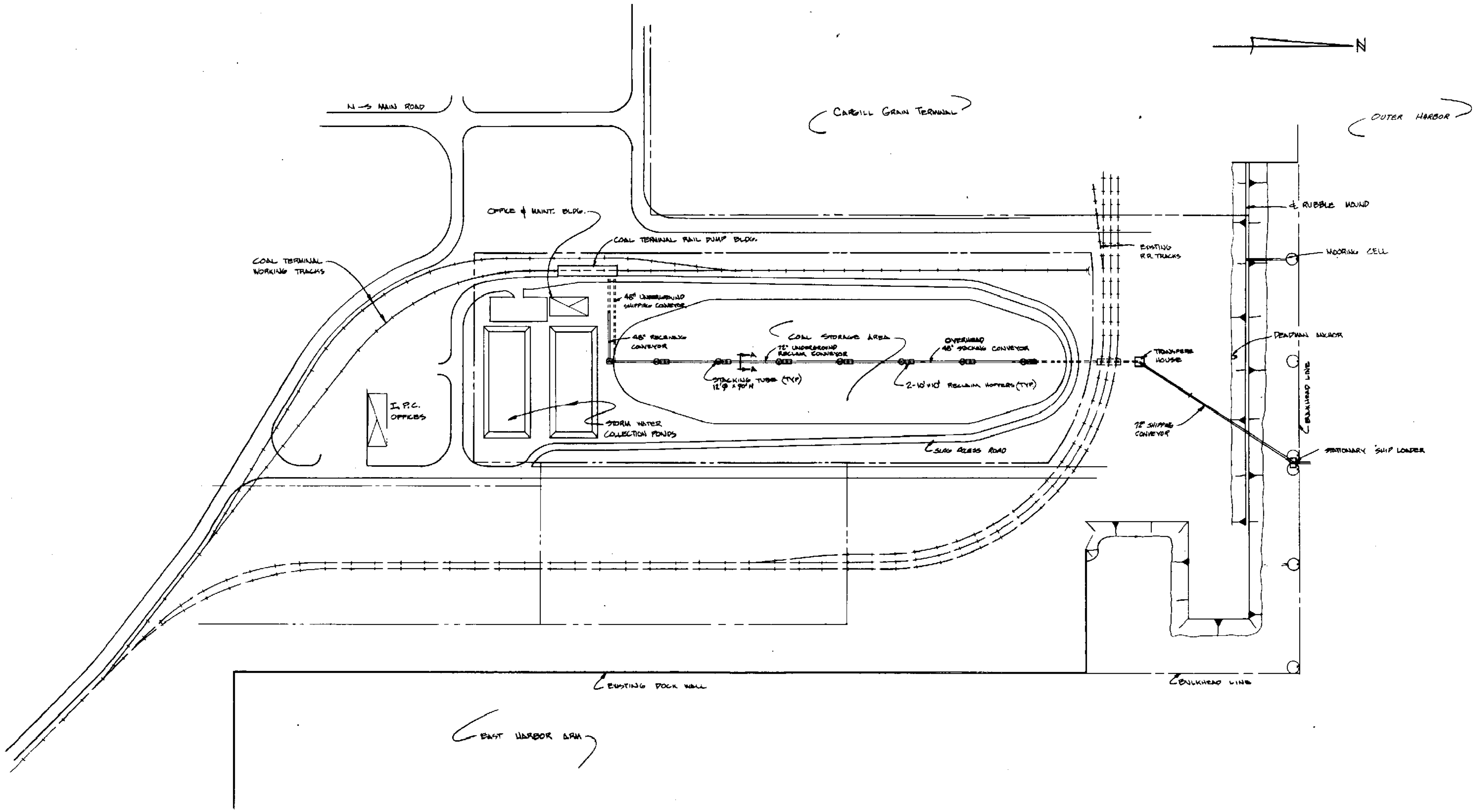
APPENDIX C

BURNS WATERWAY HARBOR
SITE AND FACILITY DRAWINGS

DRAWING SK-1
COAL HANDLING FACILITY, SITE LAYOUT



DRAWING SK-2
COAL HANDLING FACILITY, DETAIL



APPENDIX D

ABBREVIATIONS AND BIBLIOGRAPHY

ABBREVIATIONS

The following abbreviations and nomenclature have been used throughout this Report.

AAR	Association of American Railroads
ann	Annual
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
btu	British thermal unit
btu/lb	British thermal unit per pound
BWH	Burns Waterway Harbor
cif	Cost, insurance and freight
C&O	Chesapeake & Ohio Railway (part of Chessie System, CSX Corp.)
Conrail	Consolidated Rail Corp.
dwt	Deadweight tons
EEC	European Economic Community
EPA	Environmental Protection Agency
fob	Free on board
ICC	Interstate Commerce Commission
ICE	Interagency Coal Export Task Force
ICG	Illinois Central Gulf Railroad
IL	Illinois
IN	Indiana
IPC	Indiana Port Commission
Kcal/kg	Kilocalories per kilogram
L&N	Louisville & Nashville Railroad
lb(s)	Pound(s)
MAI	Moshman Associates, Inc.
MarAd	Maritime Administration (U.S.)

met	Metallurgical
mil.	Million
mmt	Million metric ton(s)
mt/y	Million ton(s) per year
nm	Nautical mile
NSPS	New Source Performance Standard
nt	Net ton (same as short ton or 2,000 lbs)
N&W	Norfolk & Western Railway Company
OECD	Organisation for Economic Cooperation & Development
OPEC	Organization of Petroleum Exporting Countries
RR	Railroad
S	Sulphur
STCE	Standard Ton of Coal Equivalent
tph	Tons per hour
t/y	Tons per year
U.S.	United States
VLV	Very large vessel
WOCOL	World Coal Study

BIBLIOGRAPHY

American Association of Port Authorities. AAPA Advisory, Vol. XV, No. 40. Washington, DC: The American Association of Port Authorities. October 5, 1981.

Association of German Coal Importers. Annual Reports 1979, 1980. Hamburg, Germany. 1981.

Bhagwat, Subhash. International Coal Trade: Trends and Practices. Illinois State Geological Survey. Champaign, IL: Illinois Institute of Natural Resources. 1981.

________. Market Potential for Illinois Basin Coal: An Update. Reprint 1980 from Proceedings of the Illinois Mining Institute, 87th Annual Meeting, Springfield, IL. October 18-19, 1979.

________, and Collias, Theodore J. The Future Competitive Position of Coal from the Illinois Basin. Illinois State Geological Survey -Mineral Notes 81. Champaign, IL: Illionois Institute of Natural Resources. 1981.

Coal Transportation Conference. Coal Exports and Transportation. (Papers delivered ... May 4-5, 1981). Arlington, VA. 1981.

Illinois, Department of Mines and Minerals. Illinois Coal Production for 1980 All Mines. 1981.

________. Ninety-eighth Coal Report of Illinois 1979. Dir. Brad Evilsizer. Springfield, IL: State of Illinois. 1980.

Indiana Coal Association. Tonnage for Mines Operating in 1980. Unpublished data. 1981.

Indiana Geological Survey. Coal and Industrial Minerals Section. Directory of Coal Producers in Indiana. comp. Walter A. Hasenmueller. Bloomington, IN: Indiana Geological Survey. July 1980.

Keystone Coal Industry Manual 1980. New York, NY: McGraw-Hill, Inc. 1980.

Moshman Associates, Inc. Port of Indiana/Burns Waterway Harbor Economic Impact 1980. Prepared for Indiana Port Commission. Washington, DC. May 1981.

National Coal Association. Coal Facts. Washington, DC: National Coal Association. 1977.

________. A Forecast for U.S. Coal in The 1980's. Washington, DC: National Coal Association. 1981.

Organisation for Economic Co-operation and Development. International Energy Agency. Steam Coal: Prospects to 2000. Paris, France: Organisation for Economic Co-operation and Development. 1978.

President's Commission on Coal. Coal Data Book. Washington, DC: U.S. Government Printing Office. February 1980.

________. Recommendations and Summary Findings. Washington, DC: U.S. Government Printing Office. March 1980.

________. The Acceptable Replacement of Imported Oil With Coal, Staff Report/Findings. Washington, DC: U.S. Government Printing Office. March 1980.

Smith, William H., and Stall, John B. Coal and Water Resources for Coal Conversion in Illinois. Illinois State Geological Survey Cooperative Resources Report No. 4. Urbana, IL: State of Illinois. 1975.

Treworgy, C.G., Bengal, L.E., and Dingwell, A.G., Reserves and Resources of Surface-Minable Coal in Illinois. Illinois State Geological Survey Circular 504. Champaign, IL: Illinois Institute of Natural Resources. 1978.

U.S. Army Corps of Engineers. Institute for Water Resources. National Waterways Study, Summary of Study Team's Proposed Recommended Plan. Fort Belvoir, VA: U.S.Army. July 1981.

U.S. Congressional Board of 97th Congress. Office of Technology Assessment. Coal Exports and Port Development, A Technical Memorandum. Washington, DC: U.S. Government Printing Office. April 1981.

U.S. Department of Commerce. Bureau of Economic Analysis. Industry-Specific Gross Output Multipliers for BEA Economic Areas. Washington, DC: U.S. Government Printing Office. 1977.

________. Maritime Administration. Great Lakes Ports Coal Handling Capacity and Export Coal Potential. Cleveland, OH: Great Lakes Regional Office, Maritime Administration. December 1980 (Rev. May 1981).

________. National Port Assessment 1980/1990. Prepared for MarAd by Office of Port and Intermodal Development. Washington, DC: U.S. Government Printing Office. 1980.

________. Social and Economic Statistics Administration. Area Economic Projections 1990. Washington, DC: U.S. Government Printing Office.

U.S. Department of Energy. Energy Information Administration. 1980 Annual Report to Congress, Vol. 2: Data. Washington, DC: U.S. Government Printing Office. April 1981.

________. 1980 Annual Report to Congress, Vol. 3: Forecasts. Washington, DC: U.S. Government Printing Office. March 1981.

________. 1980 Annual Report to Congress, Vol. 3SUM: Summary. Washington, DC: U.S. Government Printing Office. May 1981.

________. Demand for World Coal Through 1985, Analysis Report prepared by International Energy Analysis Division, Office of Integrative Analysis. Washington, DC: U.S. Government Printing Office. 1979.

________. Demonstrated Reserve Base of Coal in the United States on January 1, 1979. Washington, DC: U.S. Government Printing Office. May 1981.

________. Economic Analysis of Coal Mining Costs for Underground and Strip Mining Operation. Prepared by Sidney Katell, Morgantown, WV. Washington, DC: U.S. Government Printing Office. October 1978.

________. Energy Transitions: The Forecasts Through 2020, Issue Paper. Washington, DC: U.S. Government Printing Office. March 1981.

________. Financing Increased Coal Production, Analysis Report prepared by Financial and Industry Studies Division, Washington, DC: U.S. Government Printing Office. March 1981.

________. Overview of United States Coal Export Terminals. Prepared by Soros Associates, New York, NY. Washington, DC: U.S. Government Printing Office. September 1980.

________. A Study of the Demand for Imported Thermal Coal in Western Europe, 1980-2000, Vol. I. Prepared by F.R. Schwab & Associates, Inc. New York, NY. November 1980.

________. Interagency Coal Export Task Force. Interim Report of the Interagency Coal Export Task Force, Draft for Public Comment. Washington, DC: U.S. Government Printing Office. January 1981.

U.S. Department of Labor. Bureau of Labor Statistics. Employment and Earnings August 1981, Vol. 28, No. 8. Washington, DC: U.S. Government Printing Office. August 1981.

U.S. Department of Transportation. Coal Transportation Task Force. Transporting the Nation's Coal (Draft), Interim Report. Washington, DC: U.S. Government Printing Office. January 1981.

________. St. Lawrence Seaway Development Corporation. The St. Lawrence Seaway. Washington, DC: Office of Communications and Consumer Affairs. 1981.

U.S. Environmental Protection Agency. Office of Planning and Evaluation. Economic Impact of Interim Final and Proposed Effluent Guidelines Coal Mining. Washington, DC: U.S. Government Printing Office. 1976.

U.S. General Accounting Office. Low Productivity in American Coal Mining: Causes and Cures. Report to the U.S. Congress by the Comptroller General. Washington, DC: U.S. Government Printing Office. March 1981.

U.S. President. Proclamation. National Port Week. Washington, DC. October 2, 1981.

Wier, Charles E. Coal Resources of Indiana. Indiana Geological Survey Bulletin 42-I. Bloomington, IN: Indiana Department of Natural Resources, Geological Surveys. 1973.

________. "Indiana" in 1980 Keystone Coal Industry Manual. New York, NY: McGraw-Hill, Inc. 1980.

World Coal Study. Coal-- Bridge to the Future, Report of the World Coal Study (WOCOL). ed. Carroll L. Wilson. Cambridge, MA: Ballinger Publishing Company. 1980.

________. Future Coal Prospects: Country and Regional Assessments. eds. Robert P. Greene and J. Michael Gallagher, Dir. Carroll L. Wilson. Cambridge, MA: Ballinger Publishing Company. 1980.